

THE VETERINARY MAGAZINE

*A JOURNAL FOR THE PRACTITIONER, AND FOR THE ADVANCEMENT
OF COMPARATIVE MEDICINE.*

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No. 9.

THE ACCIDENTS INCIDENT TO THE CASTING AND CONFINING OF ANIMALS FOR SURGICAL OPERATIONS.¹

BY TAIT BUTLER.

When the subject of this paper was selected, I intended presenting a more exhaustive review of not only the injuries and accidents incident to casting and confining for surgical operations, but also a consideration of the various contrivances used for these purposes. My inability to collect, in the time at my disposal, all the data desired, together with the fact that it would occupy too much of your time, is my reason for merely giving you to-day the results of my investigations thus far, but at some future time, when these investigations shall have been completed, I hope to again call your attention to this important subject.

Believing that something definite in regard to the number of accidents occurring in proportion to the animals thrown and confined would be of interest, and that it might serve some good purpose to know what methods, if any, were most responsible for such accidents, I addressed about one hundred and fifty circular letters to veterinarians throughout the United States and Canada, propounding such questions as I thought might best elicit the information desired.

Replies have been received to something over half the letters sent out, and when condensed and classified, I obtain therefrom the following facts:

So far as I can judge from the indefinite statements given, the accidents reported were not in a larger proportion than 1 in 300 operations and, possibly, the serious accidents were not

¹ Read before the United States Veterinary Medical Association, at Des Moines, Iowa, September, 1895.

more than 1 in 500. But these figures are somewhat in the nature of estimates and not sufficiently definite to be of very much importance.

Twenty-two reported no accidents at all, while 65 have had a total of 168 more or less serious accidents, and as the following will show, these have usually been very serious. Of these 168 accidents, 81 were fracture of the vertebræ, or as we commonly say, "broken back;" 23 were fracture of some of the pelvic bones, usually the ilium; 17 were fractures of the femur; 7 broken ribs; 3 were fractures of other bones. 9 were muscular strains of the back or loins; 8 strains of the muscles of the legs; 5 were strains or ruptures of the ligaments or their attachments; 2 ruptures of the aorta; 1 rupture of the heart; 2 from suffocation; 4 from shock or exhaustion, and the other 6 were of a complicated or varied character. Of 81 fractures of the vertebræ, 28 were of the lumbar—chiefly 1, 2 and 3; 13 fractures of the dorsal, 5 fractures of the cervical and the remaining 15 were merely given as "broken back."

Contrary to what is usually stated in the "books," the average age of the animals suffering from fracture of the vertebral column was a trifle under seven and a half years, and if we exclude two extreme cases in which the animals were over twenty years old, the average is about seven years.

Of the seventeen fractures of the femur the average age of the animals was less than four years.

These facts do not mean that the bones of horses of the age indicated are more easily fractured, but, rather, that the number thrown at these ages far exceeds those thrown in old age; and also, that in fracture of the femur, its frequent occurrence in young animals may be due to the fact that imperfect union has taken place between the centres of ossification.

Of the 131 fractures which occurred, thirty-two were during the operation of castration, thirty-seven were thrown for operations on the teeth, twenty-nine were thrown for operations necessitated by diseased bones, and the remainder for other operations. The large number resulting during the operation of castration is because of the large number thrown for that operation, while the large number in connection with operations on the teeth and bones indicate that disease of the bones in one location frequently indicates an improperly nourished osseous system. We may also draw from these facts a

lesson in caution : namely, that it is unwise to cast for operations of this sort when such can possibly be avoided.

Of the eighty-one cases of broken back, fifty-nine were confined with the English or French hobbles ; fifteen were thrown and confined with some form of side-line where the hind feet were secured with the legs in an extended position and in the vicinity of the shoulders or sternum, and the remaining seven were confined in stocks and other ways.

Of the other fifty fractures, twenty-three were confined with the old style of "hobbles" while the remaining twenty-seven accidents resulted from the use of the various forms of side-lines and "throwing harnesses." For fractures of the ribs the hobbles were entirely responsible, and the pelvic bones also suffered most from this method, but the femur was fractured only five times with the hobbles, but twelve times with other forms of apparatus.

Of the other accidents—thirty-seven in all, fifteen resulted from the use of the hobbles and twenty-two in the use of other contrivances. Muscular strains of the back resulted most frequently when hobbles were used, while similar accidents to the extremities were more common from use of the side-lines and other apparatus.

From the above, if we remember that not more than sixty per cent of those replying use the hobbles, it is evident that a large percentage of the accidents which have been collected resulted when the English hobbles were used. In the light of these facts we have no hesitation in declaring that the use of the English hobbles cannot be too strongly condemned. They have but one commendation, as far as we can ascertain, namely, the facility with which the extremities are confined when the animal is thrown. We know of no other method where so little time and labor is required for making the animal fast after he is cast.

There are numerous ways of casting the animal, differing only in the feet or combinations of feet taken from the animal's control. Of all these none is less natural for the horse and more irrational for the operator than that of taking the whole four feet out of the animal's control at the same time. By having a sufficiently large number of assistants the animal may be prevented from doing himself injury, but our seven fractures of ribs were all the result of this inhuman and unnatural

method of casting horses. After experimenting with numerous ways of casting, we believe that any method that does not allow the animal full control of at least one hind foot is not natural and consequently produces more concussion in the fall. Our opinion is, that when one front and one hind foot on the same side are left freely within the control of the animal the best method of casting is obtained, but as more than ninety-five per cent of the accidents collected were the direct result of confining and not of casting, we may safely leave the latter question to each individual operator to use that plan which best suits his taste and convenience. The matter of confining is the important one for us, and to this question we wish to briefly call your attention before concluding.

While in principle there are but two methods of confining animals that are cast, yet for greater convenience and facility of discussion I shall divide the methods into *three classes*. *The first*, is that employed in the use of the hobbles, where the whole four feet are allowed to extend to one common point of fixture. *The second*, is where the fore feet are fastened in a flexed condition while the hind ones are extended and fastened in the vicinity of the elbow or sternum. *The third* position is one in which the forelegs are flexed and confined to the chest, and each hind leg is flexed to as great a degree as possible, and each fastened in that position, thus bringing one hind leg on either side of the animal and confining the foot in the region of the flank.

The first two methods are entirely responsible for all the *fractures* of the back and a majority of the strains of the back which we have collected. The two last are responsible for eighty per cent of the strains and fractures of the legs. Of this eighty per cent, the method of allowing the animal to extend the hind feet forward is responsible for nearly all if not all the accidents. In brief, the method that permits the horse to extend all four feet and allows him to use that as a fixed point in his muscular efforts is responsible for nearly all the broken backs, while the method which allows the hind legs to extend directly forward in the region of the chest is responsible for nearly all the accidents to the extremities, and these two classes of accidents constitute more than eighty-five per cent of all those occurring. We are of the opinion, and it is based on an eleven years' experience, that the safest method of confining

is one which flexes the hind legs as completely as possible and fastens them separately on each side of the animal, the fetlocks being brought down as closely as possible to the stifles.

At present we shall not go into these remarks more deeply, but venture the statement that, regardless of old-accustomed practices or sentiment, the English hobble is the most dangerous method of confining horses now in practice, and that the man who continues to use them in these advanced days puts a premium on the most serious and certainly most embarrassing class of unfavorable occurrences in practice.

IMPROVED METHOD OF ADMINISTERING ANESTHETICS TO HORSES.¹

BY J. C. MEYER, JR.,
Cincinnati.

In this paper, with a few exceptions, I will confine myself to the use of chloroform, from the fact that this agent in my experience is preferable to any other anesthetic, either single or combined, that can be given by inhalation. There are, however, other drugs such as chloral hydrate and morphia that can be given to great advantage to enhance the anesthetizing of horses with chloroform, without adding to the risks or dangers that are usually ascribed to it. The entire success of this improved method of chloroforming horses is attained by putting them in slings with a few simple means of restraint during the inhalation of the anesthetic.

The following is a description of my method :

If consistent, the horse may be prepared by allowing him to fast twelve to twenty-four hours before he is subjected to the operation. This, of course, must be dispensed with when we have urgent cases to treat, such as strangulated hernia, obstruction of the esophagus, parturition and the like.

Eight to twelve drams of powdered chloral hydrate are given in paper capsules about one hour before the chloroform,

¹ Read before the United States Veterinary Medical Association, at Des Moines, Iowa, September, 1895

followed by a draught of water, either from a bucket or bottle. As soon as the hypnotic action of chloral is established, the horse's body is covered by a hair mattress, four inches thick, of the shape of a blanket, with a seam along the spinal column to act as a joint, and held in place by a surcingle and breast strap. A like protection secured by a throat latch is provided for his head, in the shape of a hood made of the same goods with openings for the reception of the ears and one for each eye. I have used the mattresses for ten years at my hospital when casting horses and find it superior to a bed of straw, hay or sawdust, for the reason that during the course of most any operation, through struggling or otherwise, the litter finds its way into the wounds greatly to the annoyance of the operator, not to mention the danger of septic infection from these foreign substances. The greatest advantage, however, lies in the fact that it makes no difference where the horse falls, he invariably falls upon the mattress and cannot hurt himself. The horse thus padded is placed on the operating floor and his head is securely tied by means of halter shanks to each side of the room. He is then put in slings as on ordinary occasions. The sling is suspended by an endless chain pulley hooked to a rope hanging from the ceiling. A wooden block would answer, but the former is preferable because the horse can be lowered by degrees. His right forefoot is hobbled, flexed and tied to a surcingle near the withers. His left forefoot is secured in the same manner as soon as the weight of his body drops into the sling.

This precaution is necessary to prevent the horse from striking the operator with his forefeet, also to keep him from damaging the chloroform inhaler. Having accomplished this, the horse's fore-quarters are suspended in the slings and the chloroforming process can be carried on with comparative ease and safety.

The inhaler that I use is an ordinary tin paint bucket with a guarded rim compressed into an oval shape to fit snugly over the nasal region so as to admit as little air as possible. If the horse's face is small or the can too large I wrap a towel about his nose to close up the crevices, thus preventing the escape of the chloroform vapor. Some horses take kindly to the inhalation of chloroform, others offer some resistance but very soon submit after taking several dozen inspirations. As soon as

unconsciousness is observed he should be lowered to the floor, but not before he is perfectly limp and indifferent to corneal irritation. The sling may then be removed if the contemplated operation requires it, if not, it may as well remain until the operation is completed and be used in raising and supporting the semi-comatose horse. During the surgical work the administration of chloroform is to be continued according to indications, with which all practitioners are familiar, always being careful to have the poll of the horse high enough for the head to be in an oblique direction from above downward. This is accomplished by taking a sack filled with hay and making a head-rest of it. Such a precautionary measure is essential, as it prevents the chloroform from flowing over the lips and cheeks, irritating them, but what is more serious if this step is ignored, is that the chloroform is likely to find its way into the nostrils, down the trachea to the bronchial tubes, giving rise to strangulation, bronchial and pulmonary inflammation. It is necessary to state, that when the horse is profoundly under the anesthetic, its inhalation should be either wholly or partially discontinued, according to the indications manifested. I have found little or no occasion to secure the hind extremities unless it is to display the inner side of the lower limb or the groin for an operation. Then a hobble is attached to the upper limb, drawn forward and secured to some convenient place, or held by an assistant. After the operation is finished, it is a wise plan to keep a man at the horse's head for ten or fifteen minutes to prevent his getting up; he being in a semi-conscious state is likely to stagger about and fall if allowed to rise too soon. Provision should be made for plenty of fresh air, and, if it was unnecessary to remove the slings, he should be raised and supported by them until he has entirely recovered from the anesthesia, otherwise he should be held by the head and braced by attendants after he is on his feet. From this extended description it may appear to you as though my method of preparing horses for an operation is complicated and tedious, especially when we consider the fact that we have at our command, hobbles as a means of restraint.

For the following reasons I believe that we are amply rewarded for taking the necessary time and trouble to chloroform horses, when performing painful, protracted surgical operations.

1. For the safety it affords us against the struggles of our subjects under fire or the knife. We cannot afford to risk our limbs and life by any hazardous practice not for the benefit of the horse or his owner.

2. For the protection of our patients against injuries they may inflict upon themselves while being cast, or while struggling during the course of the operation. The old method of chloroforming horses is of itself a dangerous procedure. They usually offer a more violent resistance to it than they do to the surgical part of the operation without any anesthetic. I might mention here that I have had horses fracture their spine while undergoing the old style of chloroforming, therefore I abandoned its use until recently, when I discovered the value of slings to take the place of hobbles to avoid such accidents. On this point I claim priority, as I have failed to find anything reported in the literature at my command that describes this method. Others may have practiced it, but considered it too good to impart.

3. For the comfort it affords the operator. He is not continually interrupted by the struggles of the patient. His instruments are not thrown out of his hands, lost or broken, and the wound is not liable to become filled with filth. By reason of this advantage the operation can be performed in less time and far more accurately; besides, the control of hemorrhage is better managed.

4. For the humane principle it involves. Operative surgery under the profound influence of chloroform is absolutely painless, and on this account we may, under this plea, resort to surgical work that is otherwise prohibited by law in some States, such as docking of horse's tails; moreover, under this humane practice the business of castration is more likely to fall into the hands of the veterinarian than of the gelder, which by no means is to be sneered at.

5. For the scientific aspect that the use of anesthetics has to the public. Most every individual that has witnessed my method of chloroforming horses was highly elated with the process, and quite a number complimented the veterinary profession in having achieved a wonderful step in the advancement of science in this direction.

6. For the pecuniary benefit we are apt to derive. There is a great deal of business in the hands of such non-professionals

as gelders, dentists and coachmen, which of right belongs to our fraternity, The use of anesthetics to perform this work would enable us to catch this trade, if I may be allowed to use this mercantile phrase. The cost of chloroforming a horse does not exceed twenty-five (?) cents. It requires from four to eight ounces, when used economically, for ordinary operations, and, if it should require more for protracted operations, such as difficult parturition, the cost will always justify its use, and an extra pecuniary compensation can easily be obtained.

With your kind permission I will enumerate a list of surgical operations where we are justified in administering anesthetics. The extraction of molars; extensive trephining; gouging and sawing the frontal or maxillary sinuses; operations on the eyeball; extirpating of the same; passing a probang; removing odontophytes; laryngotomy; esophagotomy; extirpation of lateral cartilages of feet; removing foreign substances from feet, such as broken nails, splinters of wood; scraping of bones; removing calculi from bladder; operation for champignon; amputation of penis; castration of stallions and cryptorchids; firing dangerous horses; parturition; laparotomy; docking of tails and a number of other operations where cocaine and other narcotics are inapplicable.

A few words with reference to the action of narcotics as an adjuvant. In the translation by Dr. Faust in the *American Veterinary Review* I learn that Dr. Esser has been experimenting with the administration of chloroform and ether, by previously giving hypodermic injections of morphia, in narcotizing horses, for operations, but not in connection with chloral hydrate per os or morphia intravenously. In a number of cases I have given an intravenous injection of two grains of morphia about ten or fifteen minutes preceding the chloroform administration, and found its effects well pronounced and aiding materially in narcotizing the patient. However, I observed a sequel to this morphia injection worth mentioning, and that is, that it produced a tympanitic condition of the bowels, with accelerated breathing for several hours afterward. These complications, however, wore off without treatment. I consider chloral hydrate the most valuable adjuvant. A full dose given about one hour before the operation acts admirably. The patient much more readily succumbs to the action of the chloroform inhalation; besides, it is perfectly safe, and I highly

recommend its use in veterinary hospitals where ample time can be taken to anesthetize a patient, and adequate time given him to rally, which in some cases requires fifteen to twenty minutes. I do not wish to convey the idea that these auxiliary agents are absolutely necessary to successfully anesthetize a horse, as there are circumstances that will not admit of their use. The advantages are that the anesthetic acts quicker and that the horse offers less resistance, which in my opinion is one-half the battle. Now as to the dangers attending my method of chloroforming, as compared with the old hobble system, I will say that I have not met with the slightest accident or injury to any animal that has been anesthetized in a standing posture supported by slings. I cannot see how it is possible if ordinary good judgment is exercised.

I will, however, call your attention to one feature, namely, the lowering of the horse to the floor as soon as he becomes unconscious, so that the weight of his body will not exclude the ingress of pure air. I have not employed sulphuric ether nor alcohol, separately nor in conjunction with chloroform as an anesthetic, for the reason that the latter is considered most powerful, and, in my experience, is none too potent to produce the desired anesthesia in horses.

Professor Miculics contributed an article to the *Berl. Clin. Wochenschr.*, No. 46, 1894, entitled "Chloroform versus Ether," in which he states that after giving ether a thorough test as a narcotic he has reverted to the use of chloroform. He asserts that ether is more asphyxiating and is likely to produce bronchitis and pulmonary edema. He cites a case that resulted in death from the latter complication two hours after the use of ether, and seven others that he found recorded in veterinary literature. Death due to cardiac ailments during the inhalation of anesthetics may be of importance in the practice of human medicine, but in veterinary medicine I feel as though we are justified in taking the risk after making an ordinary examination of the organ and finding its action regular. I have on numerous occasions attempted to destroy horses by chloroform inhalations and found it a difficult task. In some instances the chloroform gave out and I had to resort to pithing, asphyxiating, shooting or braining the subject.

There are, however, idiosyncrasies that render horses more susceptible to the action of chloroform. I find that colts and

debilitated and phlegmatic horses succumb more readily than do highly nourished, nervous and vigorous subjects.

I do not claim that my method of administering anesthetics, as explained in this paper, is by any means perfection, but I feel as though it is a step in the right direction, and by the aid of science, patience and repeated experiments we will be enabled to perfect the chloroforming of horses with the same ease that burglars are credited with chloroforming human beings by simply throwing a sponge saturated with the drug into the room.

TUBERCULOSIS IN MASSACHUSETTS.

BY JOHN M. PARKER.

During the past year much adverse opinion and antagonism has been aroused in Massachusetts over the legislation on Tuberculosis. No other matter has attracted so much attention among the members of the Veterinary Profession, and no subject has interested the farmers and agricultural classes to anything like the same extent.

Of course the greatest interest has centred in the work of the State Board of Cattle Commissioners.

You were informed a year ago of the nature of the bill adopted by the legislature in June, 1894. That bill gave the Commissioners almost unlimited power. Up to that time animals were condemned by physical examination alone. In September of last year, the Commissioners decided to use the tuberculin test in place of physical examination. In order to do this, it was felt that not only should animals, as reported by the several inspectors, be tested with tuberculin, but that systematic regulations should be adopted throughout the State, providing for the quarantining of all animals until tested; for regulating the importation of all animals from without the State; for providing a market at Watertown and Brighton, at which tested animals might be procured by those desiring to have them; and lastly for the regular and systematic examination of all neat cattle throughout the State; and the destruction of all animals that reacted to the test.

The system adopted by the Commissioners for the carrying out of these ideas embraced the following points:—

1. "The test with tuberculin of all suspected cases reported by local inspectors.
2. The regulation of the importation of all neat stock into this Commonwealth from all points without its limits.
3. The quarantining of all such imported animals until tested with tuberculin, and either tested or certified as sound.
4. The establishment of regular quarantine stations at which all animals brought within the limits of the Commonwealth should be delivered in quarantine.
5. The forbidding of the importation of all neat stock within the limits of this Commonwealth, unless delivered at these points, except upon written permit of the Board.
6. The branding, in a distinct way, of all animals that had successfully passed the tuberculin test.
7. A systematic examination, by the use of tuberculin, of all animals within the State, beginning with the counties of Nantucket, Dukes and Barnstable."

This policy of the Board was first made public at Worcester on October 25, 1894, and came into force one month later on November 25, and this meeting at Worcester was the first intimation to either the general public or the Veterinary Profession that any such radical measures were proposed.

On the adoption of this policy by the Commissioners the work of the Board, as stated in their Annual Report, may be subdivided into four distinct heads, as follows:—

1. "The attending to the inspection of all animals reported by the local inspectors as suspected, and the testing by tuberculin of all such as are reported to be tuberculous.
2. The quarantining of all neat cattle which are delivered at the quarantine stations at Watertown, Brighton or Somerville, and the testing with tuberculin of such of them as are not to be immediately slaughtered at the Brighton abattoir, or which are not to be immediately transported to points without this Commonwealth, which calls for a weekly service extending over three days.
3. The systematic examination with tuberculin of all herds within the State, which includes the test by tuberculin, the destruction of all diseased animals, the disinfecting of the contaminated premises, and the branding of all animals found free from disease.

4. The granting of permits for the transportation of animals from without the limits of this Commonwealth to various points within the State, where they are immediately quarantined, and the testing of the same with tuberculin in the same manner as already described."

The most important of these is, I think, the first, *i. e.* ; the work of the local inspectors and the testing with tuberculin of all animals quarantined by them.

The law which I had the honor of reporting to this Association at our meeting in Philadelphia last year, provided that "The Mayor and Aldermen of cities and the Selectmen of towns shall within thirty days after the passage of this act, and thereafter annually in the month of March, appoint one or more persons to be inspectors of animals and provisions." Under this law 394 persons have been appointed; of these 394 only fifty-eight are veterinary surgeons, 136 are farmers, ten are cattle dealers, twenty doctors of medicine, eight butchers; the rest are made up of grocers, painters, provision dealers, wood and coal dealers, etc.

The inspectors were expected to inspect all herds in their different localities, twice yearly; all suspected cases to be quarantined and reported to the Board of Cattle Commissioners, in whose hands the final decision rested. From November of last year all suspected animals have been tested with tuberculin and all those reacting to the test have been slaughtered. Local inspectors are also expected to be present at slaughter-houses while killing is going on, and all animals found diseased, however slight the disease, are condemned to the rendering tank.

In addition to the local inspectors, the Commission was empowered to appoint agents to assist in the work of testing suspected animals.

The second head: "The quarantining of all neat cattle which are delivered at the quarantine stations at Watertown, Brighton or Somerville, and the testing with tuberculin of such of them as are not immediately slaughtered at the Brighton abattoir, or which are not immediately transported to points without the limits of this Commonwealth, which calls for a weekly service extending over three days," was undertaken for the purpose of providing a market where farmers could secure tested animals to take the place of those slaughtered and to insure that only healthy animals are brought into the State.

The Board encountered many difficulties in this portion of the work. To carry out their ideas, it was necessary to quarantine the State and prohibit the importation of cattle from other States, unless they had previously undergone the tuberculin test. Agents were appointed to take charge of this work at Brighton and Watertown markets, where all animals "were subjected to the tuberculin test before being offered for sale."

In applying the tuberculin test to this class of cattle innumerable difficulties were encountered. In referring to the matter the Commissioners in their Annual Report point out that "These cattle are collected from different localities and brought together for the first time. They have been put into crowded cars, have suffered the excitement attending an unusual journey, have probably received their food and water at irregular periods, and in every possible way have been subjected to conditions utterly foreign to their ordinary existence. Neat stock are not mere machines, but are excitable animals, materially affected by unusual conditions. Another significant fact in relation to the cows brought to these markets is, that they generally are, or are about to be new milch; and it is within the knowledge of all who have had practical experience in this direction that this greatly increases their nervous sensibilities, and experiment shows that this actually has a direct effect on their internal temperature."

The Commissioners further say, "An examination of the tests at these markets has proved to the satisfaction of the Commission that all these abnormal conditions have very materially complicated the temperature tables, as a result of which they have made a few mistakes in arriving at their conclusions."

An examination of the tests "covering the first six weeks of the work," will show that 6.21 per cent of all animals offered for sale at the markets have been shown to be tuberculous."

The Commissioners say, that "fewer errors of this sort occurred in the last three weeks than during the earlier experiences." The fewer number of errors being due to the fact that a greater reaction was considered necessary by the Commissioners before the animals were condemned. During the earlier period a fewer number of degrees of reaction was taken as indicating tuberculosis; but from the large number of errors creeping in, the necessary reaction was increased, so that

there was less likelihood of error in this direction, but at the same time, there was a greater danger of passing tuberculous animals as sound. That this danger existed is shown by the report of the Inspector of the Boston Board of Health. At the Brighton abattoir, where all animals condemned by the Commissioners were slaughtered, there were in all (from November 25, 1894, till January 1, 1895) 104 animals condemned and killed on the tuberculin test; of this number eighty-two were tuberculous and twenty-two were non-tuberculous, showing a percentage of error of 21.1. On the other hand, sixty-three animals after being pronounced free from disease, the brand of the Commonwealth having been placed on the right hip, were bought by dealers and killed for beef; of these sixty-three animals four or 6.34 per cent were found to be tuberculous; while in one week, in February, ten animals were condemned as tuberculous, and of the ten, six were found to be free from disease.

The third head: "The systematic examination with tuberculin of all herds within the State, which includes the test by tuberculin, the destruction of all diseased animals, the disinfecting of the contaminated premises, and the branding of all animals found free from disease," is perhaps the feature of the work that has roused the greatest opposition among the farmers. To use their own words: "The Commissioners felt that the best method of protecting all parties and eradicating the disease was only to be obtained by a thorough scientific examination of all neat stock throughout the State. They, therefore, decided to begin a systematic examination of all animals in the State, county by county, taking proper precaution as fast as all the animals in each county had been examined, destroyed or marked, to prevent, by quarantine regulations, the importation within the limits of animals which had not already been so examined."

The Commissioners decided to begin this systematic examination in the counties of Nantucket, Dukes and Barnstable. These counties were chosen because of their natural position and because "they are comparatively small, contain but few animals, presumably as healthy as any in the State, and that the small appropriation would be practically exhausted by the time the examination of the cattle within these limits could be completed."

"At the time of the making of their report the Commissioners had completed the examination under this order of all animals in the island of Nantucket, and they report that the result in the island has been very satisfactory; that of 665 animals examined only six have been found diseased."

The summary of their work for two months shows that at the Brighton examination, eighty-nine, or about 6.21 per cent of all animals examined were tuberculous, while at Nantucket six were tuberculous, or less than one per cent. The low percentage in these counties was due probably to their isolated position, and to the employment of simpler methods of keeping and feeding the dairy stock.

In January of the present year, the appropriation of \$100,000 having been expended along with the \$50,000 allowed the Commissioners by the Governor, the Commissioners applied for a largely increased appropriation, with increased powers to carry on the work begun in November, 1894; and in his inaugural address the Governor outlined the work to be done by the Commissioners. He said, "The vast importance of the work now undertaken under the law of 1894 by the Cattle Commission cannot be overrated. A great crisis confronts us.

. . . The alarming spread of tuberculosis is confined in great measure to the last ten years. The vigorous and systematic measures now adopted are similar to those employed when pleuro-pneumonia invaded Massachusetts. . . . In such legislation as may be enacted I know that your wisest care and best judgment will be exercised, and that no backward steps will be taken."

And in February, at the Hearings before the joint Senate Committee on Agriculture and Public Health, the Commissioners again referred to the methods that had been so successfully employed in eradicating contagious pleuro-pneumonia, the inference being that these methods would be equally successful with tuberculosis. At these hearings the opponents of the Cattle Commissioners developed unexpected strength. There was a feeling among them that tuberculosis could not be handled in the same way as contagious pleuro-pneumonia. Contagious pleuro-pneumonia is an extremely rapid and fatal disease; it will usually develop in from three to six weeks after exposure, and often acute cases are fatal in from seven to twenty days after the animal is attacked. On an average from

sixty to eighty per cent of animals exposed will contract the disease, and about fifty per cent of these will die.

On the other hand, Bovine Tuberculosis is an extremely slow and chronic disease ; it is not a fatal disease, but it has a tendency to become self-limiting ; it is not a highly contagious disease, for a large proportion of cases are entirely harmless, and unusually long exposure and intimate association are necessary before infection takes place ; and further it is not confined to the bovine but is found in all domestic animals as well as man.

When the last case of contagious pleuro-pneumonia is destroyed the danger ceases to exist ; with tuberculosis it is entirely different. In fact the conditions surrounding the two diseases are so dissimilar that it is impossible to draw any analogy between them.

Further, it was believed that the danger was not so great as to justify such extreme measures as those proposed ; for while there is a certain element of danger in the use of the meat or milk of cows that were *badly diseased*, yet these cases could, as a rule, be picked out by physical examination, and with the use of tuberculin in suspicious cases the danger would be reduced to a minimum, and would be by no means as great as to justify the use of tuberculin throughout the State, with the accompanying expense to the State and loss to the farmers which would result from the total destruction of all animals that would react to the test.

After a great deal of discussion in the legislative bodies, a compromise bill was adopted, giving an appropriation of \$100,000 for the carrying on of the work, restricting the use of tuberculin to such cases as were thought to be diseased on physical examination, and allowing the farmer full value at the time of slaughter, without taking into consideration the fact that the animal at the time of slaughter was afflicted with tuberculosis ; this applied only to cattle that had been in the State six months.

In consequence of the smallness of the appropriation and the restrictions placed on the use of tuberculin, this bill did not meet with the approval of the supporters of the Commissioners, and strenuous efforts were made to have the Governor veto the measure ; finally the bill was submitted to the Attorney-General for his opinion on the matter. This opinion is

important and of great interest to all interested in this question. In his letter to the Governor the Attorney-General says: "Section 10, amending Sec. 45 of the Act of 1894, provides that whenever the Board of Cattle Commissioners, after an examination of contagious disease among domestic animals, becomes satisfied that the public good requires it, they may cause such animals to be killed without appraisal or payment, or without expense to the owner." The section further provides that "if it shall subsequently appear, upon post-mortem examination or otherwise, that said animal was free from the disease for which it was condemned, a reasonable sum therefor shall be paid to the owner thereof by the commonwealth; provided, however, that whenever any cattle afflicted with the disease of tuberculosis are killed under the provisions of this section, the full value thereof at the time of slaughter, for food or milk purposes without taking into consideration the fact that the animal at the time of slaughter was then afflicted with such disease, shall be paid to the owner thereof out of the commonwealth, if such animal has been owned within the State six months continuously prior to its being killed."

The constitutional question, says the Attorney-General, is the provision that when meat unfit for food by reason of tuberculosis is seized, or cattle with the same disease are killed, the owner shall receive full value of the carcass for food or milk purposes, "without taking into consideration the fact that the same is then infected with such disease."

It may well be assumed that a carcass which is infected, or an animal that is infected with tuberculosis has practically no value for meat or milk purposes. That such was the intention of the legislature is clearly deducible from the provisions of Statutes 1894, Chap. 491, Sec. 10 of said statute, (as amended by the bill in question) which authorizes the destruction of a carcass, whenever, in the opinion of the inspector, it is diseased or unfit for food. Sec. 15 of same chapter makes it a penal offence for anyone to sell or have in his possession, with intent to sell for food, any diseased animal or any diseased carcass. Statute 1886, Chap. 318, Sec. 2, also makes it a penal offence to sell the milk of a diseased cow. The meat or milk of a cow that has been pronounced unfit for sale by the legislature, and the sale of which is a criminal offence, cannot be regarded as having any market value.

The section under consideration, therefore, must be taken to authorize and require the payment to the owner of a diseased cow, or an infected carcass, which by the determination of the legislature is worthless, a value equivalent to the value of sound cattle or sound meat. This is not compensation, it is a gift.

If it were provided that the Board having jurisdiction of the subject matter might condemn all suspected meat or kill all suspected cattle leaving it uncertain whether the disease existed, the legislature might reasonably provide, that compensation for cattle so destroyed should be paid without determining the question of disease. But the statute in question is not of that character. It provides for a definite adjudication as to the existence of disease or otherwise. This fact having been determined, the bill provides that the owner shall receive "reasonable compensation" for cattle that prove to be sound, and which were killed under mistake by the officers. This is as it should be. But, on the other hand, in respect to cattle as to which there is a final determination that they are diseased, and therefore worthless for food and milk purposes, the bill provides that this fact shall be disregarded in estimating the damage to the owner, although it is a fact which destroys their value.

The Constitution (Chap. 1, Sec. 1, Art. 1) authorizes the legislature to impose taxes "to be used and disposed of . . . for the public service." The legislature under our constitution, has no right to take money by taxation from one man to enrich another; and it is of no consequence how meritorious upon general consideration the position of the recipient may be. Money raised by taxation can only be used for public purposes.

Applying this principle to the bill in question, I am of the opinion that so far as it requires the payment of a fictitious value in all cases to the owners of cattle killed as diseased, and consequently worthless, it is an appropriation of public money for the benefit of individuals. It takes money from the common fund contributed by all citizens, and confers it as a gift upon such owners of diseased cattle. If this is so, it is an unauthorized exercise of the power of taxation.

The Attorney-General then suggests: "That the legislature has the right to order such compensation as it deems reasonable to individuals for the inconvenience and annoyance of having

their cattle seized and destroyed, and especially upon suspicion and when it is not certain that they are tainted." He then concludes, "upon the foregoing principles and upon such consideration as I have been able to give the matter in the brief time allotted to me, I am constrained to advise your Excellency that the provisions of the bill in question, which provides that owners of cattle shall be paid full value thereof for food, and milk purposes, without taking into consideration the fact that the animal or carcass is at the time of taking infected with tuberculosis, are unconstitutional."

These, in brief, are the principal points in Attorney-General Knowlton's letter to the Governor, declaring certain sections of the Tuberculosis Bill unconstitutional. After this opinion had been given, the senate recalled the bill, eliminated the objectionable clauses, and passed to be engrossed a new bill, which received the Governor's signature. The bill as it was finally adopted by the legislature amends the old bill of last year so that inspectors shall examine *sheep* and *swine* as well as cattle. It shall also be their duty to inspect barns and stables when directed to do so by the Commissioners.

Section 27 of the old law is amended so that when an animal is under quarantine over ten days the expense of such quarantine is paid by the Commonwealth. Section 45 is amended so that instead of half value, owners shall have full value for animals condemned as tuberculous, the value not to exceed sixty dollars for each animal.

Section 13, of Chap. 496 of 1895, provides that the sum expended under the act shall not exceed \$100,000.

Section 14 provides that the use of tuberculin shall be restricted to cattle brought into the Commonwealth from without its limits, and upon any animal or animals, upon consent in writing, of the owner, and upon any animal condemned as tuberculous upon physical examination by a competent veterinarian.

It will be seen that this act gives the owner full compensation. The practical working of the act being that the State buys cattle that react to the test, paying the owner full valuation for them; the cattle then come into the possession of the State, when they are killed and the post-mortem examination made.

It will be noticed that the principal difference from last year is that the compulsory use of tuberculin is restricted, and the

farmers get full value instead of half value for animals destroyed on suspicion, before they are proved to be diseased by post-mortem examination.

Farmers in Massachusetts, as a rule, are not opposed in principle to the inspection of their herds; they are not opposed to the adoption of measures looking to the eradicating of disease; but they are opposed to the sensational, alarming and exaggerated head lines in newspapers (see *Boston Herald*) describing the condition of affairs as being so fearful, and leading the public to imagine that milk is the prime cause of tuberculosis in human beings. They are opposed to the compulsory use of tuberculin in their herds because they feel that the percentage of errors in the work of the Commission so far has not been such as to warrant the general use of tuberculin throughout the State. Again many of the farmers have grave doubts whether the sacrifice demanded of them will result in the complete eradication of the disease from among their herds. They would not object, however, to the thorough and frequent physical examination by competent persons, with the tuberculin test in suspicious cases. This, with the thorough disinfection of infected barns would, in the opinion of many, remove all serious danger, and gradually a better condition of affairs would result. The question of expense is also a grave one. The work of the Commission in the isolated counties of Nantucket, Dukes and Barnstable, where there are only 665 cattle; with their work at Brighton, Watertown and Somerville; and the examination of isolated cases reported by inspectors for about two months, absorbed more than \$100,000.

When one considers that there are 223,536 cattle in the State and the examination of 5394 cost over \$100,000 some vague idea of the cost is secured.

The lessons to be learned from the experience gained in Massachusetts would seem to indicate, 1. That while tuberculin is a most valuable aid to diagnosis, yet under certain conditions, especially immediately after transportation, when the animal is excited and the temperature variable, the practice of taking only one temperature before the injection of tuberculin is a bad one, and under these circumstances reliance on tuberculin is dangerous and is likely to lead to errors of a serious kind.

2. That in a very large proportion of cases of tuberculosis that react to tuberculin, the disease is extremely slight; in this

condition the animal is not a source of danger to either human beings or other cattle.

3. Under favorable circumstances many such cases would entirely recover.

4. The reports and collections of statistics show that a large proportion of cases of tuberculosis in human beings occur in people who have recently moved into houses previously occupied by consumptives. This points to the direction that should be taken by sanitarians for measures looking to the prevention of tuberculosis in human beings. The same holds good in cattle. In the barns lies the greatest danger, and in pure air, sunlight, cleanliness and disinfection, we have our sheet anchors in the prevention of tuberculosis in dairy cattle.

And in conclusion, it is the opinion of many practitioners in Massachusetts that frequent and careful physical examination with the use of tuberculin in suspicious cases, along with the thorough disinfection and renovation of infected premises, with greater attention to cleanliness and improved hygienic conditions, would give better results and do more permanent good, besides being more practical and more economical than the wholesale compulsory use of tuberculin, and the total destruction of all animals that react to the test.

THE GALVANIC BATTERY IN VETERINARY PRACTICE.

By T. D. HINEBAUCH,
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Up to the present time, medical and surgical electricity has been practiced but very little by those who are engaged in the veterinary profession. Why such conditions exist we are unable to say, unless it be that remedies, seemingly more useful, have taken the attention of our experimenters in Veterinary Medical Therapeutics.

The writer has made use of Galvanic electricity, in its various forms, for the diagnosis and treatment of disease in its various forms, since he entered the ranks of the veterinary

profession. He has met with such excellent success that he deems the subject of enough importance to warrant the present paper.

Galvanism or Voltaic Electricity.—Galvanic or voltaic electricity is that form of electricity which arises from chemical action, especially that attending the dissolution of metals.

Experience has demonstrated that chemical electricity is most conveniently generated by the reaction that takes place between two metals and some acid solution. Zinc is the metal most commonly used, at the expense of which electricity is produced. The other metal merely acts as a conductor. The acid generally used is sulphuric. Water is also used and is an important factor. It serves as a solvent for salts that are formed by the action of the acid upon the metals. As the water approaches saturation the current weakens, and when it has once become thoroughly saturated by the salts which have formed, it becomes inactive.

At present we are using what is known as Smee's battery, (Fig. 1), now manufactured by the Jerome Kidder Manufacturing Company, of New York City. It is economical and exceedingly easy to manage. It consists of a plate of corrugated platinum between two plates of zinc, in a solution of sulphuric acid (one part) and water (ten or twelve parts).

The order of the parts in this battery and their reaction are as follows: (1), zinc; (2), sulphuric acid; (3), platinum. Reaction, $\text{Zn} + \text{H}_2\text{SO}_4 = \text{ZnSO}_4 + \text{H}_2$.

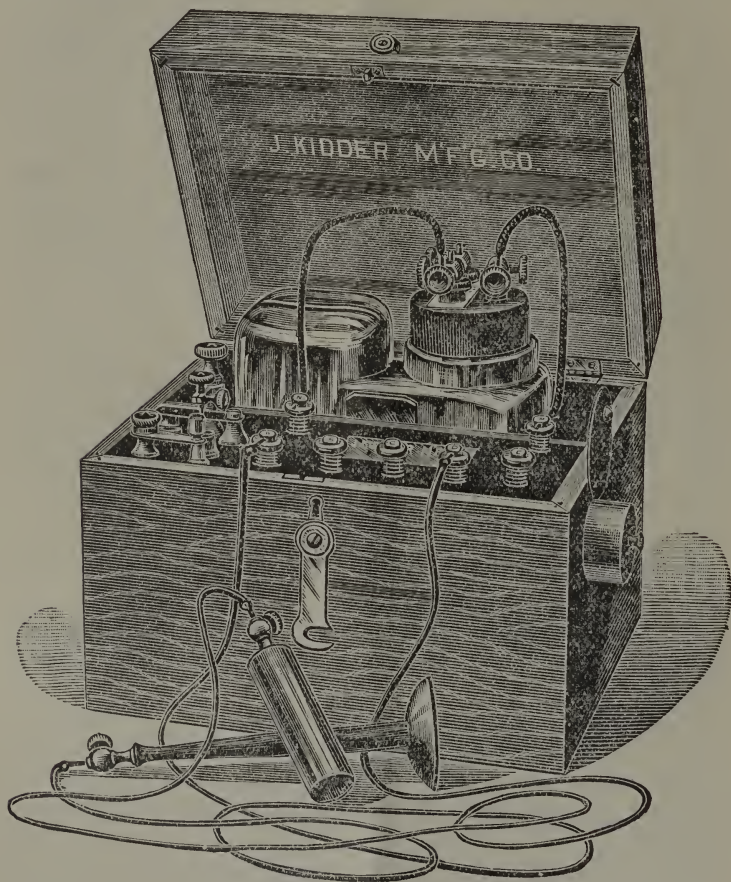
The chemical action of this battery is rapid, much more so than that of sulphate of copper and bichromate of potash batteries.

The platinum plate should be corrugated or made into folds, so as to give as great a surface as possible. If the surface be covered with finely divided platinum, so as to roughen it, the hydrogen which is formed will escape instead of adhering to its surface.

The zinc plates must be amalgamated or they will be destroyed in a short time. This is especially the case if ordinary commercial zinc be used in constructing the battery. Pure zinc is slowly dissolved. The rapid action of dilute acid on zinc is due to the impurities it contains, such as iron, lead. These impurities are electro-negative and cause local currents of electricity. If the battery be closed, these currents interfere

with the action which produces the main current. If the current is open, they continue to keep up their action and in time destroy the zinc. We might here state that in the cheaper grades of batteries the zincs rapidly wear out, owing to the above defects.

Fig. 1.



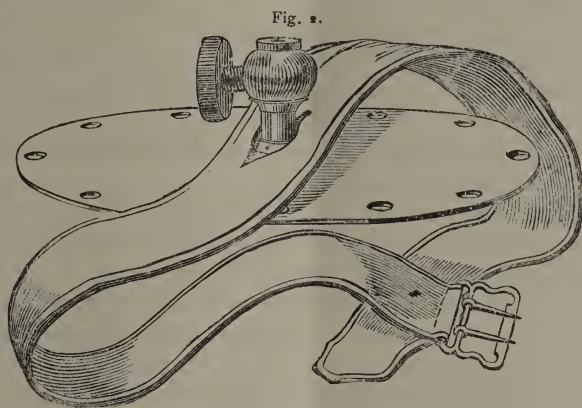
In order to avoid this local action as much as possible we amalgamate the zincs with mercury. The process of amalgamation is as follows : First immerse the zinc in dilute sulphuric acid until the surface is perfectly clean, then dip the zinc into, or pour over the surface, mercury, rubbing it on well, with a cloth. The mercury spreads very rapidly over the surface of

the zinc and gives it a bright, shining appearance. A teaspoonful of mercury kept in the cup will keep the zincs amalgamated. Care must be taken to keep the platinum free from mercury, or its surface will become covered, gradually weakening and finally destroying its usefulness.

After using several varieties and makes of batteries, among which were dry cell, bichromate of potash, sulphate of copper, etc., we do not hesitate in saying that the zinc-platinum acid battery is preferable to any other.

The only disadvantage that can be advanced against the zinc-platinum acid battery is its first cost. This cost is due to the high price of platinum.

Its many advantages over the other forms are so patent that its single disadvantage is many times outweighed. It lasts



longer, does not early get out of order, is always ready for use, and above all is reliable at all times.

The battery furnished by Jerome Kidder and used in my work, while it is a little expensive to commence with, is much cheaper in the long run than any battery which I have yet used. The construction is of such a nature that it can be used without any danger of injury to the battery by upsetting. The attachments are automatic in their action, so that the least traction on them draws them out, and does not upset the machine. I have found the firm perfectly willing to make any design of appliance which I have desired. Fig. 2 represents an adjustable electrode with band. These electrodes are very convenient for making applications to wounds of any kind. If

it is desired to use the metallic piece only, it can be applied with gentle pressure over the part; I, however, attach a sponge to the small holes which are in the rim of the plates. This is kept constantly moist and the current flows very freely, making the application for any desired length of time with the least trouble. Should it be desired to attach the electrode to some portion of the body, the band can be lengthened by merely using a piece of cloth or leather strap. The firm constantly keeps on hand metallic brushes, sponges, and all of the ordinary appliances which are needed for the application of electricity in veterinary practice.

Size of Battery.—The battery should be large enough, so that when in use there is always about four times the strength of current available, above that required. The current will then be steady, and give the best possible results. If the battery be small the current weakens, and if the current used be a very mild one, as is often the case, it will become irregular, stop entirely, and in many ways cause much trouble and inconvenience.

A large single cell or two small cells will be sufficient for all ordinary purposes.

Should the veterinarian possess a hospital that is lighted with electricity, apparatus can be procured so that the current used for lighting can readily be made available.

Physiological Action of Electricity.—It must be borne in mind that there is a difference in man and animals, regarding the susceptibility to electrical action, and that there is also a very wide range between animals of the same class.

In our experiments on the horse (thus far all experiments have been confined to the horse) we have found those which were so susceptible to a current, that even the mildest one we could use, caused so much irritation, that its use had to be discontinued. Just as medicines have a different action on different horses, so also has a current of electricity a different action on different individuals. There is a great difference in the average susceptibility of different breeds of horses. The heavy draught will tolerate a current more than twice as strong as the thoroughbred. Generally speaking a coarse, rough horse used to constant labor is less susceptible to electric currents, just as they are less susceptible to the action of drugs, than the more delicately proportioned ones that are not inured to hardships.

Action of the Galvanic Current on the Skin.—The outer covering of the skin is a poor conductor of electricity and the current no doubt, when mild, enters by points through sebaceous and sudoriferous glands. The smaller the point the greater the density, the current being constant, hence it is that a metallic brush is more powerful than a sponge. A wet sponge lightly pressed causes more pain than when firmly pressed against the skin.

The chemical effects on the skin of the horse differ in degree and also in kind. In experimenting on horses to observe the action of electricity, we must use an animal that has a white, tender skin, and also that is susceptible to mild currents. If the electrodes are of small diameter, not exceeding one-half inch and slightly moistened, there will appear under the negative pole small, pale vesicles, which rise slightly above the surrounding skin. These vesicles contain a fluid, serum-like in appearance. If these vesicles are punctured and the fluid tested with litmus paper it will give an alkaline reaction. If the experiment be further continued, by increasing the strength of the current, the fluid changes slightly to a deeper yellowish color, and a blister is gradually formed.

Under a positive pole with a strong current a blister is rapidly formed containing a dark colored serum, which is acid. In performing these experiments, the opposite pole should be attached to a large wet sponge four or five inches in diameter, which should be pressed against the skin.

It must always be borne in mind that the negative pole is more irritating than the positive. If paralysis exist we would use the negative pole to produce contraction of the muscle. On the other hand if the parts are irritable, and they most always are, use the positive pole.

The benefits derived from treating diseased tissue by electricity depends upon the fact that electricity aids and improves nutrition.

To test the strength of the current without the use of the galvanometer place one pole in the palm of the hand and hold the other between the thumb and forefinger. The poles should be wet with salt water or warm water; currents that can be just felt by the hand are often too strong to be applied to a horse. The greatest mistake is apt to be made by using the current too strong.

APPLICATION.

Diagnosis.—In our practice we make constant use of the battery in case of lameness where the least doubt exists regarding the correctness of the diagnosis.

Electricity as a means of diagnosing lameness or soreness depends upon the principle that when a mild current is sent through sore or diseased tissue, it produces pain. The intensity of the pain produced is nearly in direct proportion to the extent of the disease, providing the tissue has not lost its sensibility. We say *nearly*, for we have found that a very mild case of lameness yields readily to currents, while a case seeming twice as severe will not show twice the pain with the same current.

For the above reasons electricity ought to be brought into general use by all veterinarians. If the anatomy be thoroughly understood, we believe there is no case of lameness, however difficult it may seem, which cannot be diagnosed by its use.

We have on several occasions diagnosed difficult cases of lameness, by the use of the battery after several veterinarians as well as ourselves, failed by a most thorough and complete examination to locate the seat of the same. We call to mind one case that was exhibited before the members of a Veterinary Medical Association. There was not a single member who could or would definitely locate the diseased part, yet the diagnosis of this case by the battery was extremely easy and satisfactory. The above case had been treated by two veterinarians for about six months without benefit. Both had located the lameness in a different place and treated accordingly. A line of treatment in accordance with our diagnosis was successful.

In using the galvanic battery for diagnosing lameness we always begin with large sponge electrodes, moistening the skin thoroughly previous to making the application. If the parts be dirty we first thoroughly cleanse them with warm water and soap before the electrodes are applied. The current should be mild at first, and if the desired results are not produced, it can gradually be strengthened by drawing out the tube covering the coil. If a severe current be used at first the animal will become irritated and the further use of the battery will have to be discontinued. We have observed instances where horses after having received a strong current were so suspicious that they would not even tolerate the noise of the battery.

RECORD OF CASES.

In reciting cases we will not go into detail, but will give only the major facts and conditions.

Case I.—Paralysis. The patient a four-year old western mare, weight 900, the property of the writer, caught her head in the hay chute and in her efforts to extricate herself brought on facial paralysis of the muscles of the lip and nostrils of the right side. The nerve affected was the facial portion of the seventh pair, on the right side. We applied the galvanic current by localizing the course of the nerve and at once contractions of the muscles involved took place. The application was made as follows, one electrode was placed at the crossing of the nerve and ramus of lower jaw and pressed firmly. The other was moved over the ramifications of the seventh pair as well as over the muscles. Improvement began at once. Application was made daily and in three weeks a complete recovery was the result.

Case II. A two-year-old gelding the property of Mr. F., of Kalamazoo, Mich., was found in the pasture with left ear and left side of face paralyzed, otherwise healthy. Treatment similar to that in case one. The current was applied twice a week for six weeks, when the case was discharged as approximately cured. There still existed a slight weakness which gradually disappeared, and at the end of three months the muscles behaved under current as do perfectly healthy ones.

Case III.—Strain of the flexor pedis perforans and perforatus of a trotting stallion, the property of Mr. M., of Fargo, N. D. The strain was the result of over-work on the track. The first treatment consisted of hot applications, blisters, rubber bandages and rest. This treatment was continued from the first of September, 1892, to February 1, of the following year, with but slight beneficial results; the lameness not even disappearing. At that time we were called in and recommended the use of the battery, the application to be very mild and made every other day. We also recommended exercise at the walk. In four weeks the lameness had disappeared entirely and the enlargement began to gradually disappear. On May 1 it had entirely disappeared and the horse was again put in training, the battery being used twice per week during the entire season. When last seen during the latter part of August, was healthy, able to take hard and fast work, without showing any

signs of his former trouble. During the spring of 1894 the stallion stood for service, and on July 15, was again put in training. At this time, August 21, he is entirely sound and has shown a fast mile in his work.

The above case is of much interest to us because an apparently perfect cure has been established. When we take into consideration that but very few horses ever stand training after so severe strain of the tendons as this one sustained, and that they usually have to be blistered and fired repeatedly, so that they are blemished for life, we can readily appreciate the advantage that this treatment has over the old method. We must also bear in mind that this animal has already stood two seasons hard work.

Case IV.—A bay stallion the property of Mr. M., of Fargo N. D., sustained a severe injury to the flexor pedis perforatus and perforans of the fore leg. The injury was claimed to be the result of over work, but on making a thorough examination we came to the conclusion that it was due to striking with the hind foot, as the part which yielded to pain in the application of the battery or of pressure was very limited, not including more than half an inch of the tendon, while it was much swollen from the knee to the fetlock joint. In this case we applied a very mild current twice per day, and it was noticeable that the swelling disappeared under the use of the battery, reappearing in about three or four hours after the current had been withdrawn. Each reappearance, however, was much less marked than the swelling which existed previous to each application. I only report this case as a partial success, because we have used the battery only three weeks, and what the ultimate result will be I am unable to say ; but I must say this, that I have never treated by the old method any case which showed so marked improvement in the same length of time. I also wish to call special attention to the fact of the swelling disappearing during the application of the current, which was continued at each time for from thirty to forty-five minutes.

Case V.—A bay mare, three year old, property of the writer, fell through a bridge, April 27, and bruised the flesh of the fore leg in front of the fetlock joint and behind the knee joint, so that pieces of flesh about the size of a silver dollar dropped out two days after the accident. We used iodoform dressings and bandaged until July 28. At that time the parts had not

healed, nor did they show any tendency to heal. We determined then upon the use of the battery, and applied the positive pole to the wound directly over, having first thoroughly washed it. We continued the application for fifteen minutes at a time, once per day. Its effects were immediate, the wound taking on a healthy appearance and healing as rapidly as could be desired, until at the present time only a cicatrix remains.

Case VI.—A bay mare, seven years old, property of Mr. P., of Moorhead, Minn. A running sore just about the coronary band on the right fore foot. The wound was the result of a calk, and had existed for two years, resisting all treatment which was intended to heal. We first removed the diseased tissue surrounding the wound, until only healthy tissue was exposed on all sides, and then applied the battery as in case five. At the end of four weeks the wound was entirely healed, only a small scar remaining, which will be permanent as the hair follicles are destroyed. We also consider this one of our most interesting cases from the fact that it was chronic in nature, had existed for two years, and at the end of that time yielded so readily to the action of the current.

A NODULAR TENIASIS IN FOWLS.

BY VERANUS A. MOORE,
United States Bureau of Animal Industry.

In the spring of 1894, a fowl (*Gallus domesticus*) died at the experiment station of this Bureau with a disease characterized by nodules or tubercle-like bodies in the intestinal wall. Upon closer inspection the lesions were found to be in the sub-serous and muscular coats, and not, to any appreciable extent at least, in the glands. In the intestinal contents there were a large number of small tapeworms, many of which were firmly attached to the mucosa. Later in the season about twenty fowls from the same flock were used for experimental purposes, and upon post-mortem examination were found to be more or less affected with this disease. In addition to these, one of four fowls which were examined from a flock of poultry on a farm

adjoining the experiment station was found to be infested with tapeworms and the intestinal wall studded with nodules. A fowl received from Newbern, N. C., and one from Tackett's Mills, Va., were similarly affected.

Although but one fatal case came under my observation, the extent of the lesions in several of the fowls examined indicated that sooner or later many of them would undoubtedly have succumbed to the disease. The close resemblance of the nodules to tubercles renders necessary a somewhat detailed description of the lesions and of the means by which this disease can be readily differentiated from tuberculosis without the aid of laboratory facilities.

DESCRIPTION OF THE DISEASE.

The fowl which died apparently from this disease was much emaciated, and the lesions were restricted to the intestinal wall. In the fowls used for other purposes, there were no observable symptoms by which the nodular affection could be detected prior to post-mortem examination. Diphtheria was the immediate cause of death of the fowls from North Carolina and Virginia. All of the fowls examined, affected with this disease, were from one to three years old.

The nodules were invariably more numerous in the lowest third of the small intestine. They occasionally appeared, however, in small numbers in both the duodenum and colon. The larger and to all appearances older nodules were found in the ileum near the ceca.

In the badly affected portion the nodules gave the appearance of closely set protuberances, varying in size from barely perceptible areas of elevation to bodies 4 mm. ($\frac{1}{8}$ inch) in diameter. In some instances they appeared to overlap one another. When separated by a band of normal tissue, they were round or somewhat lenticular in form. In the latter case the long diameter was usually transverse to the long axis of the intestine. The larger nodules were of a pale or dark yellowish color, while the smaller ones varied in shade from the more highly colored areas to the neutral gray of the normal serosa. To the touch they gave the sensation that would be expected if the sub-serous and muscular coats were closely studded with small, oval, solid bodies. The mucosa presented similar elevations. Attached to the mucosa over the nodules

were a number of tapeworms. There were also in the more advanced cases a variable number of small (0.5 to 1 mm.) areas over the larger nodules in which the mucosa had sloughed, leaving small ulcerated depressions.

The larger nodules contained a greenish-yellow, necrotic substance which appeared, in the advanced stages, as a sequestrum with a roughened surface. On section it had a glistening, homogeneous appearance. Surrounding the necrotic substance was a thin layer of infiltrated tissue. The smaller nodules contained a more purulent-like substance, and the smallest appeared to the naked eye as areas of infiltration. Sections of the affected intestines showed upon microscopic examination that the heads of the tapeworms had penetrated the mucous membrane and were situated in different layers of the intestinal wall. They were frequently observed between the villi. As would be expected, the heads were not readily detected in the necrotic masses contained in the larger nodules, but were almost invariably seen in the smaller ones. In a few sections the tapeworm could be traced through the mucosa to the nodule in the muscular tissue in which its head appeared. In the earlier stage of the nodular development there is a cell infiltration about the head of the worm. This process continues until the infiltrated tissue reaches a considerable size.

The worms attached to the mucosa were usually small. A larger form was commonly found in the intestinal contents. Although macroscopically they appeared to be different, Dr. Stiles found that they were presumably of the same species.

It appears from the literature that this disease has not heretofore been demonstrated in America. In 1881, Piana¹ described a disease of fowls in Italy due to the presence of *Tenia bothrioplitis*. His article, however, deals more with the anatomy and classification of the infesting cestode than with the character of the lesions it produced. As he illustrates the nodules and heads of tapeworms in the intestinal wall there can be no doubt of the similarity of the lesions to those in the disease here described. Although fowls and birds are not infrequently infested with tapeworms, the lesions produced by these parasites are, with the exception indicated above, said to be more or less catarrhal in nature.

¹ Mem. della Accademia della Sc. Dell'istituto di Bologna, Ser. 4, 7, 11 (1880-1881), p. 387.

On account of the unsettled classification of the cestodes of fowls I was unable to determine the species to which the tapeworm found associated with this disease belongs or to identify it with the one described by Piana. The material was referred to Dr. C. W. Stiles, Zoölogist of the Bureau, who made the following preliminary report:

"The form agrees with Piana's *Tenia bothrioplitis* of 1881; it is more than probable that this form is synonymous with *Davainea tetragona* (Molin, 1858) R. Bl., 1891; A study of the original types of *Davainea echinobothrida* (Megnin, 1881) R. Bl., 1891, and *Tenia pluripunctata* Crety, 1890, will undoubtedly show that these species are very closely allied to *if not identical* with this form."

ECONOMIC IMPORTANCE.

The importance of this disease is much greater than it at first appears as the close resemblance of the nodules to those of tuberculosis renders it of much significance from a differential standpoint. As the intestines are stated to be frequently the seat of the specific lesions of tuberculosis in fowls, it is of the greatest importance that a thorough examination be made before a positive diagnosis is pronounced. There are already several statements concerning the presence of tuberculosis in fowls in which the data given is not sufficient to differentiate the disease from the one here described. A somewhat analogous disease of sheep¹ caused by a nematode (*Esophagostoma columbianum* Curtice) has led to the deliberate destruction of many animals, the owners believing that tuberculosis was being eliminated from their flocks. As the inquiry into the cause of poultry diseases becomes more general, it is probable that this affection will be occasionally encountered, and unless its nature is recognized it may in some instances, like the sheep disease, lead to an unwarranted destruction of property.

In addition to its importance in differentiating tuberculosis it is in itself a malady worthy of careful attention. The fact that it has already appeared in two flocks in the District of Columbia and also in the states of North Carolina and Virginia, shows that the infesting cestode is quite widely distributed in this country. It is highly probable that the total loss it

¹ Animal Parasites of Sheep, Bureau of Animal Industry, Department of Agriculture, 1890, p. 165.

occasions both from deaths and from the shrinkage of poultry products, due to the chronic course of the disease it produces, is very large. The life history of the tape-worm will be fully described by Dr. Stiles in a forthcoming report of the Bureau.

DIAGNOSIS.

Tuberculosis is, as before stated, the only known disease for which this affection is liable to be mistaken, and it is of much importance that the two diseases should not be confounded. The diagnosis has not in my experience been difficult, as in every case the attached tapeworms were readily detected upon a close examination of the intestinal contents, or of the mucous membrane of the infected portion of the intestine. However, the worms are quite small and could easily be overlooked in a hurried or cursory examination. In case of doubt, if the affected intestine is opened, and the mucous surface washed carefully in a gentle stream of water, the small worms will be observed hanging to the mucous membrane. This discovery, in the absence of lesions in the liver or other organs, would warrant the diagnosis of the tapeworm disease. Although much is written concerning tuberculosis in fowls, especially in Europe, the investigations of poultry diseases by this Bureau have thus far shown that it is not common among fowls in this country.

TREATMENT OF SHOULDER SLIPPING BY HYPO- DERMIC INJECTION.

BY T. D. HINEBAUCH,
Fargo, N. D.

After graduating it was our good fortune to form a partnership with a veterinarian who had been in practice seventeen years, and who had been unusually successful in his practice. His success was no doubt due, in a large measure, to deep thinking, and a desire for experimentation. It was but a few days after my work began that a large roan draft colt four years old was brought to the infirmary to be treated for "sweeny." The treatment consisted in injecting into the muscles affected a solution made up of tincture of nux vomica one part, alcohol one part, boiled water filtered two parts. An

injection of about three to four minims was made every two or three inches over the whole extent of the atrophied muscle. The excellent success attending that treatment and subsequent ones has led me to use the same method with modifications. In using this treatment it must be borne in mind that on horses of a quick, nervous temperament, a more dilute solution should be used, while on horses of a slow temperament a much stronger solution can be used. It has been my experience that in many instances where the solution was too strong an abscess formed. This abscess closed up after the course of four or five days and gradually healed, so that by the end of four or five weeks the muscles had again assumed their natural condition, with not even a cicatrix remaining where the abscess had formed.

I have employed instead of the above solution one part ammonia, one part of alcohol to two to four parts of water according to the animal—whether I wished a strong or weak solution. The use of this second solution has more often resulted in an abscess. My instructions are to always work or exercise the animals while they are being treated. This treatment has the advantage over seaton or blister in that it does not disfigure the animal for any length of time and is much more sightly.

We believe that many diseases of atrophy of the muscles, no matter where situated, can be much more readily treated by subcutaneous injection, than by the methods which are now in vogue. If the atrophy is very extensive, the daily use of the electric current in connection with this treatment resulted in very rapid recovery. We have never failed but in one case of "sweeny." We made three separate applications in that instance, and in the last one we used the material strong enough so that it formed a small abscess at each point of injection, yet when the abscesses had entirely healed and disappeared, the muscle was still very much shrunken. We are of the opinion that the vitality of the muscle had entirely disappeared. I see the animal nearly every week, and although she was operated on the last time three years ago, the spinous process of the scapula of both shoulders sticks out very prominent, the depression being so great that it leads one to the impression that there is no muscular tissue, or but very little, under the skin.

CLINICAL REPORTS.**ARYTENECTOMY FOR ROARING IN THE HORSE.***

BY DR. S. J. J. HARGER,

Professor of Veterinary Anatomy and Zoötechnics, University of Pennsylvania.

Since writing on the subject of arytenectomy for roaring, as well as reporting some cases on previous occasions, I have been still more anxious to determine the value of this operation. Hoping to have a much more valuable and exhaustive paper than the one I now present to you, I sent to the veterinarians of Philadelphia and vicinity a number of circulars explaining my motives and soliciting cases of roaring upon which I agreed to operate for a nominal fee—simply covering expenses. If the operation should prove to become successful it will be remunerative both to the veterinarian and to the horse-owner: if it be not practical it is necessary that the profession should know it.

Unfortunately, the number of cases which I was in this manner able to secure fell short of my anticipations. In some cases I have been, as yet, unable to secure any report; in others the time that has elapsed since the operation is too short to allow me to draw any conclusion, or even to ascertain the condition of the horse.

However, I will give a synoptical résumé of some cases with the termination ascertained.

Case I.—English thoroughbred stallion, seven years old, sired by Joe Hooker.

History: Roaring decided. The horse could not run a half mile in 1.05, nor even a fair quarter without falling down from suffocation.

Assisted by Dr. Charles Lintz, of Chester, Pa., I operated in April, 1895. Did well during June and July. August first was ready for a race, when he had an attack of colic, and for a few days had a discharge from the nostrils, from a part of the colic drench entering the trachea. Since the operation the horse ran a half mile in fifty-one seconds "and did not take a long breath." He also ran three-fourths of a mile—first quarter in thirty-seven seconds, second quarter in twenty-seven

* Read before Penn. State Vet. Med. Assoc., Sept. 1895.

and a half, and third quarter in twenty-five seconds, and did not roar. Owner says that it is an entire cure.

Case II.—Black mare, twelve years old. History: Heredity and cause unknown. Symptoms first recognized in 1888 and gradually increased, and in the fall of 1894 the mare was unable to work. Used for general purposes. Operated December, 1894. No complications followed. Since the operation, according to the information given me by the owner and the veterinarian, Dr. Hogg, who assisted me, the mare has performed almost all kinds of work without making any noise and is pronounced sound. At present, she is working on the tread-power of a threshing machine.

Cases III, IV and V.—Two of these three cases were common horses, while the third was fairly well bred and possessed some speed. History: Chronic roarers; heredity unknown, as nearly as I can now recollect. Operated in the early part of November, 1894, at the infirmary of Dr. H. H. Choate, Lewiston, Maine. I have no detailed history of these horses subsequent to the operation, but Dr. Choate, who assisted me and treated the patients afterwards, said in a communication to me, that the three "had made a *complete recovery*."

Case VI.—Bay mare, standard bred. History: Suffered from "distemper" in December, 1894, and has roared ever since. She could not be driven a block on a slow jog without roaring badly, and was useless for any kind of work. Operated April, 1895. She still has, though seldom, a slight cough when drinking water, which sometimes runs through the nostrils, though this does not inconvenience the animal. She can now go at the rate of ten miles an hour, without making any noise. When driven to her speed, a 2.30 gait, she makes some noise, though not very much. She is still improving, and the owner, a physician, feels confident that she will ultimately recover. To use his words, "any one having a horse similarly affected should apply—for the operation of arytenectomy."

Cases VII, VIII, IX X, XI and XII.—These cases which I assume the liberty of reporting were reported to me by Dr. H. H. Choate; they were operated on by him since November last. Out of the six, he informs me, four made a complete recovery and two make a little noise when severely exercised. I have no other details of these cases at present.

Case XIII.—Bay mare, aged. Common-bred. History: Indefinite. Symptoms marked: roared severely after a gallop of 200 yards or when worked to a cart. Operation: March, 1895. At present she makes a slight noise when driven at full speed, especially up hill, and the noise ceases as soon as she is stopped. She can be driven as fast as her speed will permit and is now serviceable.

Case XIV.—Operation at the same time as cases 3, 4 and 5. This animal is *somewhat improved*.

Case XV.—Black gelding, fairly well bred. History: Was affected with strangles complicated with pneumonia (?) during the previous June. The symptoms were not very severe. Operation: February, 1895, assisted by Dr. M. E. Conard. He makes no noise when "getting his breath," but when the lungs are filled with air he seems to have trouble in expelling it and at times coughs. Owner says he is *very much improved* but not cured.

Case XVI.—Gray mare, well bred, six years old, disease existing for three years and resulting from distemper. Symptoms irregular. At times any amount of exercise would not make her roar, while at other times exercise on the halter was accompanied with considerable noise. Operation: November, 1895, assisted by Dr. Bland, of Waterbury, Conn. After opening the larynx, I found that the movements of the vocal cords were normal and equal on both sides—a condition which was not the most favorable one for the success of the operation.

At present there is not much change in the animal. She is driven every day; when limited as to the bulk of her food and water she does not make any noise.

Case XVII.—Gray gelding, coach-horse. Operation, May, 1894; assisted by Dr. G. H. Berns, of Brooklyn, N. Y. Patient did exceedingly well for three or four weeks after the operation, and the wound healed kindly. Between the third and fourth weeks, when the wound was almost closed, he was exercised to the halter, and trotted up and down Adams street. His respirations were normal and no noise could be detected. Some three or four days later he began to cough: he would cough eight or ten times in succession and after each paroxysm the respirations would be quite raspy for some fifteen or twenty minutes: no loss of appetite, no fever, and none of the usual symptoms of laryngitis or bronchitis were observed. The

coughing spells became more frequent and severe ; the respirations gradually became more noisy. His condition grew gradually worse until one morning some six weeks after the operation when his breathing became so distressed that it was necessary to perform tracheotomy. The *tube* was left in for a week or ten days : the breathing was normal, but the moment the tube was taken out and the opening closed he would roar loud enough to be heard at some considerable distance. Two months after the operation the animal was destroyed.

Autopsy.—Original incision through the cricoid cartilage completely healed and divided portions in direct apposition. Interior of the larynx free from all granulations or foreign substances. Mucous membrane was in a perfectly normal condition, and the cicatrix could only be detected on careful examination by a slightly puckered condition of the membrane at the point where the left arytenoid cartilage had been.

Case XVIII.—Bay gelding. History : indefinite. Operation, June, 1895. The animal has not been sufficiently exercised to determine how much he roars. He has some difficulty in swallowing with a disagreeable cough when exercised. I have reopened the larynx by cutting through the crico-trachealis ligament (the horse standing with a twitch) and found the seat of operation entirely healed. Termination satisfactory.

Case XIX.—Gray mare, standard bred. History : Had pneumonia five years ago, and roared ever since. When I saw her, she was in poor condition, the respirations were very loud both on inspiration and expiration, even threatening suffocation, and the subject was not such as to allow one to draw an accurate conclusion as to the result of an operation. I did not see the mare afterward, but she died about five days after the operation.

In some instances I have met with complications : slight pneumonia in two cases, from which the animals recovered. In others there is a slight cough with regurgitation of water through the nose in drinking. The cause of both in Case XIX I do not know : there was no autopsy, but the larynx was in good condition.

I will not here offer any new suggestions in the *modus operandi*, except in suturing the mucous membrane which is difficult and tedious. In one case I used perforated shot and silver wire. I obtained a closer apposition of the edges of the incised

mucous membrane, and the cicatrix was smaller. Silk saturated with blood is slippery and the knot will loosen before completed. The shot may drop out through the incision in the larynx or may pass down into the bronchi. Even in the latter case I would not anticipate any serious trouble.

To recapitulate : from the nineteen cases, the following results may be deduced : Ten cases are admitted to be *cured* ; one is *very much improved* ; two roar only when *severely exercised* ; two *improved* and *serviceable* ; one *no difference* and *serviceable*, paralysis of the laryngeal muscles doubtful ; two died ; one termination unsatisfactory.

AN EXPERIMENT WITH DIGITALIS AND A MULE ; AN INTERESTING POST-MORTEM.

BY T. D. HINEBAUCH,
Fargo, N. D.

Case I.—On June 28, 1893, a black mule, fourteen years old, the property of Mr. ———, was brought to me to be operated upon for fistulous withers. After preparing him for twenty-four hours he was cast and operated upon with a knife in the usual manner. The case was not a bad one, hence the operation was not severe. The only difficulty encountered was the hemorrhage, which was very profuse and required packing in order to check. On being relieved from the hobbles he immediately began eating grass as heartily as though he had not been through an operation. Later he was put into a stall, and from that time on refused to eat or drink. We offered him every variety of food we could obtain ; this included hay, oats, bran, barley, grass, etc., but he still would not eat. On July 3, five days after the operation, the wound had healed as rapidly as could be expected and had a healthy appearance. He not having eaten a mouthful or drank a drop of water in the mean time, I determined to destroy him, and for that purpose used digitalis more as an experiment than anything else.

The first dose consisted of a drench of six ounces of the fluid extract of digitalis (Park, Davis & Co. preparation)

combined with one quart of moderately warm water. At the time of administering the drench—1 p. m.—he was lying down; I was then called ten miles into the country, and of course expected to find a dead mule when I returned, but much to my surprise he was standing up, and had a much better appearance than when I left him. His pulse was full, strong, and sixty per minute. I left him for the night, offering him food and water which he refused. The next day, in company with Dr. Reynolds of the Minnesota Experiment station, I gave him another dose of ten ounces of digitalis out of the same bottle; this was again added to a quart of moderately warm water and given in the evening about seven o'clock. Dr. Reynolds and I both expected that this dose would destroy him, but the next morning on offering him water he drank about half a pailful, the first he had touched since the twenty-eighth of June, but he still refused to eat. Two days later, after coming to the conclusion that the mule was proof against digitalis I destroyed him with chloroform.

Now the case is of particular interest to me in that we have been led to believe that large doses of digitalis are fatal, but whether the dose in this case was too large, so that we would not get the same results as if given in smaller doses, oftener repeated, I am unable to say, but the above are the facts in the case, and I will leave the reader to draw his own conclusions.

Case II.—A roan broncho mare presented the following symptoms: continual dribbling of urine, very offensive odor, great emaciation. On making a physical examination I found the neck of the bladder hard, and the walls thick and dense, the cavity exceedingly small, walls had lost their contractile power. We advised the owner to destroy the mare, and he turned her over to us, and as we were in need of a subject for dissection at the college, she was taken there. Post-mortem showed the right lobe of the liver and right kidney firmly united by fibrous tissue, so firmly adherent that it was impossible to separate them by traction without rupturing the substance proper of both liver and kidney. The ureter leading from the right kidney was enlarged so that it was fully half an inch in thickness throughout its entire length. The canal was entirely obliterated, not a particle of urine could pass through it. The kidney itself was partly hard and dense, the bladder was a hard, dense mass, somewhat oblong, slightly flattened on its right and left sides;

in measurement it was six inches long, four inches wide, and three inches thick. On trying to distend it, but one and a half ounces of water could be injected. The pelvis of the right kidney contained a very small amount of urine, which was high colored and of very disagreeable odor. The other organs were in normal condition, except that the left kidney was considerably enlarged, about one-third larger than normal.

This mare had first shown symptoms a year and a-half previous to the time we were called to see her. The case was somewhat interesting in showing that one kidney could usurp the function of the other in case it was necessary to do so.

At the meeting of the *German Congress of Internal Medicine* the past summer Dr. Eulenburg gave the result of the collective investigation of the antitoxin treatment of diphtheria. Among 5790 cases treated with antitoxin, there was a death-rate of only 9.5 per cent, while with 4450 treated without antitoxin, 14.7 per cent died.

THE prophylactic power of diphtheria antitoxin is undoubtedly real and will be found to be worth much, but as compared with vaccination for the prevention of small-pox, the latter confers immunity for a much greater length of time and must undoubtedly be considered of much greater value to mankind.
—*Sanitary Inspector.*

EDITORIAL.

PASTEUR'S WORK.

The death of Pasteur, the celebrated chemist and biologist, will call attention sharply to the great about-face in medicine which is slowly taking place and which is due in the largest measure to his work in the field of vegetable and micro-organisms. His discovery and isolation of the germs which are responsible for the fermentations and decompositions in nature, and, as investigation showed in after years, are the cause of specific diseases, will ever make his name memorable in the annals of science. On the germ theory rests all modern hygiene and sanitation and much of therapeutics. Preventive medicine is wholly a product of the latter-day facts which have been worked out in the laboratories of the bacteriologists. The study of the great plagues, of cholera, typhus, has all had a wonderful light thrown on it by the efforts of the famous Frenchman.

When he began his observations on microbes, which are plant life, not animal, the bacteriologist as a factor in medicine was unheard of; to-day, whether rightly or wrongly, he is claiming the most spectacular attention. Through bacteriology Pasteur in his lifetime saved his country from great losses to its wine industry, protected its flocks from ravages of anthrax, and then, as the scope of his inquiries widened, one disease after another fatal to the human kind was exploited, and its prevention tested in his laboratories. His inoculation to prevent hydrophobia was the forerunner of all serum treatments which now occupy the attention of the medical circles the world over. If municipalities but lived up to all that is known as to the spread of disease by germs such scourges as typhoid fever and diphtheria would become rare. This has been Pasteur's contribution to his age, and even he who runs may see that it is monumental in character.

TRANSLATIONS.

THE TREATMENT OF COLIC IN HORSES WITH
BARIUM CHLORIDE.

BY E. BRASS,

Assistant of the Medical Clinic at the Veterinary School in Berlin.

[TRANSLATED BY LEONARD PEARSON.]

From the fifteenth of July until the fifteenth of August of this year fifty-eight cases of colic were treated in this clinic. Of these fifty-one were treated with barium chloride and seven with subcutaneous injections of eserin. As a contribution to our knowledge of barium chloride therapy I publish the following cases with the sanction of Professor Dickerhoff.

Number I.—A fourteen-year-old dark brown mare was sick with colic for a few hours before being brought to the clinic. The mare showed great pain, rolled and strained. No peristalsis. Abdomen slightly distended. Pulse fifty-eight.

Treatment.—Intravenous injection of barium chloride 1.0 grm. in 10.0 cc. of water. First effect was noticed in five minutes. The mare raised her upper lip, elevated the tail, compressed the rectum, and expelled dry balls of feces. The symptoms of colic were slightly accelerated. In ten minutes gases were expelled followed by thin feces. In two hours the horse was free from all disturbance,

Number II.—Bay gelding, nine years old. Carriage horse. Had colic five hours.

Treatment.—Barium chloride, 1.0 grm. in 10.0 cc. of water was injected intravenously. In four minutes the animal defecated and the act was repeated in seven, thirteen and eighteen minutes. Gas was voided. The abdominal pain which was at first intense gradually disappeared. Auscultation of the abdomen revealed loud peristaltic sounds on both sides. In two hours the horse ate hay and drank water and the following day was discharged cured.

Number III.—Bay gelding, seven years old. Small work horse. Had suffered from colic for several hours. Had already

been given 0.1 gm. of eserine with no effect. The abdomen was distended like a cask. Percussion sound was abnormally loud. Auscultation a ringing sound. Respirations were oppressed. Pulse sixty-five. Veins of the neck stood out prominently. Mucous membranes red. Gait short and difficult. Eyes staring and anxious. Horse grunted frequently.

Treatment.—Barium chloride 0.5 gm. in 5.0 cc. of water was injected intravenously. Immediately the tail was raised. In a few minutes large amounts of gas were expelled and continued for thirty minutes. In thirty-five minutes feces were emitted. The flanks now became thinner and in one hour the animal seemed normal, and four hours later was discharged cured.

Number IV.—Bay gelding, six years old. Heavy work horse. Showed evidence of slight colic. Was given 0.75 gm. of barium chloride in 10.0 cc. of water. Was then walked. In a short time peristalsis became more active. Feces and intestinal gases were voided a few times. In thirty minutes the animal was ready to eat and drink.

Number V.—Bay mare. Heavy work horse. Was fed excessive amounts of Indian corn and peas. Developed colic very suddenly. The animal tumbled, rolled and made loud cries and moans. Failed to respond to the voice and whip. The head and legs were knocked recklessly against the walls. The horse was skinned in many places. A close examination of the animal was impossible. After several failures the animal was given barium chloride, 1.25 gm. in 10 cc. of water intravenously. In six minutes the animal defecated and repeated the act at short intervals and gradually became quieted so the abdomen could be examined. It was found that there was peristalsis. The next day the animal was discharged cured.

Number VI.—Bay mare, eight years old. Had been sick for twenty hours with evidences of colic. Mucous membranes were injected. No peristalsis. Pulse fifty-six. Respiration twenty-four. Moderate colicky pains.

Treatment.—Barium chloride 1.0 in 10.0 of water intravenously. In a short time gases were expelled and intestinal sounds became audible. Feces were voided in a short time; hard at first, then soft. In a few minutes the animal began to eat and in five hours was returned to the owner cured.

Number VII.—Chestnut gelding, nine years old. Had been sick with colic thirty hours and had been treated by a veterinarian without result. Was then brought to the clinic. No peristaltic sounds could be heard. Pulse weak and seventy. Temperature 38.9. Mucous membranes were injected venously. The horse drew itself together, kicked toward the belly, looked around to the flank and rolled.

Treatment.—Barium chloride 0.75 gm. in 10 cc. of water was given intravenously. In two minutes peristalsis commenced and in three minutes more feces were discharged. The next day the horse was discharged cured.

Number VIII.—Bay mare, eight years old. Draft horse. Was suffering with colic several hours. Peristalsis was entirely suppressed. Abdomen distended, pulse forty-eight, respiration twenty, mucous membranes dark red, severe colicky pains.

Treatment.—Barium chloride 1.0 gm. in 10.0 cc. of water was given intravenously. The horse gaped, raised the upper lip immediately after the injection. Large amounts of saliva and mucus were discharged from the nose. In six minutes a few isolated peristaltic sounds were distinguished which gradually became more numerous and ran together, after which feces were discharged. In thirty minutes more the horse voided large quantities of feces and the peristaltic sounds were so loud that they could be heard five steps from the horse. In the evening the horse was discharged cured.

Number IX.—Bay driving mare, twelve years old. Pulse 54, respirations 18, temperature 38.7°, m. m. dark red, mouth dry, no appetite for food or water; peristalsis could be distinguished only on the right side, occasionally colicky pains.

Treatment.—Barium chloride 0.75 gm in 10.0 cc. water. Ten minutes after the the injection feces were voided and again in twenty minutes. In the intervals large amounts of gases were expelled. The horse then became easier and lay down quietly. Peristaltic sounds were quite loud. As soon as the horse got up was ready to eat.

Number X.—Heavy bay gelding, sixteen to eighteen years old, was sick with colic for several hours. No peristaltic sounds. Colicky pains moderately intense.

Treatment.—Barium chloride 1.0 gm. in water 10.0 cc. Immediately after the injection the horse elevated the tail and lip,

and compressed the rectum. In ten minutes feces were voided, at first hard, then soft. In one hour the horse showed a good appetite and was free from all disturbance.

Number XI.—Bay gelding, twelve years old, heavy draft. Developed colic while at work. Peristaltic sounds were much depressed. Abdomen distended. Pulse 60, respiration 20, m. m. red. Intestinal pains were intense.

Treatment.—Barium chloride 1.25 grm. in water 10.0 cc. The horse was then walked. Immediately after the injection the horse elevated the tail and upper lip and in three minutes commenced to expel intestinal gases. Peristalsis became more active. The flow of gas was almost continuous, occasionally interrupted by small amounts of feces. In forty minutes the horse was quiet and placed in a stall. He immediately lay down on the side and remained in that position one hour. When he got up an extraordinary quantity of thin feces was voided. In a short time he had an appetite for hay and water and the next morning was discharged cured.

Number XII.—Sorrel gelding, twelve years old. Medium draught horse, in very poor condition. Was said to have had colic for four hours. Peristaltic sounds were absent. Abdomen distended, pulse 60 and small, respirations 20, m. m. anemic. Great pain. Had great inclination to lie down and roll.

Treatment.—Barium chloride 0.75, in water 10.0 cc. The usual actions commenced at once and the horse began to press on the rectum, but succeeded in voiding only a few balls of feces. Peristaltic sounds did not commence and the pain was increased. Pulse and respirations became more rapid and the abdomen more distended. The horse was given up but treated experimentally with eserine 0.1, but no effect was observed. Pulse was 120 and wiry, respirations 50. Ether was injected into the rectum. Death resulted in two hours. The post-mortem examination revealed a volvulus of the jejunum with hemorrhagic edema.

Number XIII.—American draught mare, nine years old. Had had colic for several hours. No peristalsis. Pulse 60, fairly strong, respirations 24, m. m. dark red. Showed great pain.

Treatment.—Barium chloride 1.25 grm. in water 10.0 cc. In a few minutes small amounts of feces were voided. Pain increased. The animal rolled on the back. Pawed continuously with the front legs while lying or standing. In order to quiet

it, it was walked for twenty minutes. During this time feces were voided frequently. Peristaltic sounds commenced. In the evening the horse was ready to eat.

Number XIV.—Gray gelding, sixteen years old, medium-sized draught horse. Was brought to the clinic with history that it would not eat. Was constipated and looking around at the sides frequently. Stood in the stall with the head down as though sleeping. Pulse 45, respirations, 16, temperature 38.2°.

Treatment.—Barium chloride 0.75 in water 10.0 cc. The tail was immediately raised. In three minutes he became uneasy, looked around at the sides, pawed with the front feet, lay down and rolled. Was then walked by the halter. Voided feces in ten, thirteen and twenty-three minutes. It was then quiet and brought back into the stable. His appetite had returned. In a few hours was discharged cured.

Number XV.—Bay gelding, heavy draft horse, had had colic for several hours.

Treatment.—Barium chloride 1.3 grm. in water 10.0 cc. In one-half a minute the horse began to salivate and wiggle the tail. The colicky pains increased. The horse grunted and attempted to lie down. In a short time extraordinarily large masses of feces were voided which were accompanied with grunts and squeals. Gases were discharged continuously. Pain increased more and more and the horse was walked. In about one-half hour the intestines were empty. The horse became quiet. The appetite was good and the next morning he was discharged as cured.

[To be continued.]

ANTIPYRETIC TREATMENT.

BY M. ALBRECHT.

[TRANSLATED BY DR. SIMON J. J. HARGER.]

In veterinary medicine, *fever* has always been treated with means varying according to the practitioner, and especially, with the general symptoms which accompany it. Dr. Albrecht has particularly studied the therapeutic methods by means of which these affections can be combated, depending upon the

rectal temperature that has always been taken with a thermometer previously tested and compared with other instruments. His observations may be generalized as follows:

The internal temperature is never as elevated in animals as in man. Nevertheless, Notz has seen 43.1° in a cow affected with mammitis, and Dieckerhoff has observed 43° in tetanus in a horse. Temperatures of 42° are not rare in the bovine species (vitular fever, parenchymatous inflammations, etc.) 41.5° is very frequent. The gravity of the general symptoms of a disease is not always in relation with the internal temperature. Also, in the same disease, the general symptoms may be very grave with a temperature of 40° , while again, only a slight acceleration of the respiratory movements and of the pulse may be accompanied with a temperature of 41° .

Albrecht has made a comparative study of the therapeutic means to combat fever in a number of subjects affected with parturient and catarrhal fevers, mammitis, etc. Some have been treated with febrifuges, others with a medication in which the antipyretics have not played any rôle. The patients of the first category received daily sixty grams (fifteen drams) of antifebrin in four or five divided doses, with a cold rectal injection of five liters every two hours. Although, as to the temperature, the febrifuge treatment has not given much better results than the ordinary methods, nevertheless, it had a slight superiority. In diseases of the dog, the temperature is generally very high, and in bronchial troubles it may attain 42° and 43.3° which may be maintained at this point for several days without the general symptoms presenting serious gravity. In these affections, antipyrin, antifebrin, baths, cold blankets produce no more beneficial effects than the ordinary treatment.

In the horse affected with infectious diseases, such as typhoid fever, tetanus and malignant strangles, temperatures of 40° and 41° may be maintained from six to eight days without there being grave general symptoms. Upon this point, Albrecht cites the following:

1. Norman horse, ten years old, constantly appearing fatigued and covered with perspiration after the least work. During seven consecutive weeks the temperature ranged from 40° to 41° without any symptoms other than a state of general emaciation and pallor of the visible mucous membranes.

Examination of the blood showed that this tissue contained an abnormal percentage of water and a diminution in the number of red corpuscles. Besides, the blood contained a large number of macrocytes and microcytes, with large granulations of leucocytes, which permitted a diagnosis of pernicious anemia.

2. In a horse affected with intermittent colic there was a simple acceleration of the pulse—60— and general malaise. Finally, the pulse beats were 100, finally 120, the members were spread out, the back arched, and death followed in four weeks. Aneurism of the anterior mesenteric artery, of the volume of a man's head and determined by the sclerosoma armata, was found at the autopsy. During the entire duration of the disease, the temperature varied from 40° to 41° without aggravation of symptoms other than those of the circulation.

In order to determine the effects that can be obtained from an antipyretic treatment, it is necessary to study the course of these affections, taking for an example typhoid fever (*brust-seuche*) of the horse in its grave form. By comparing the daily temperature with the general state of the animal, the variations in the respiratory rhythm, the heart beats, the quantity of albumen and urea in the urine, it is found that, in a general manner, the temperature is increased in proportion as the general symptoms are aggravated. Nevertheless, there are numerous exceptions, and it is not rare to find a temperature of 40° with tumultuous heart beats, 80 to 90 per minute, and respirations 40, whilst in other cases are seen a temperature of 41° to 41.5° , pulse 60 to 70 and respirations 25 to 30, without any grave alterations of any of the principal functions of the organism.

The same remarks apply to the quantity of albumen found in the urine. Albumen can be demonstrated by the heat test, a flocculent precipitate forming at about 90°C ; the same test can be made with a few drops of nitric acid, but too large a quantity of the acid dissolves the albumen. Finally, the albumen test of Esbach or a combination of heat and nitric acid can be used.

In order to determine the quantity of urea contained in the urine, Dr. Stellvaag has examined the urine of several horses affected with typhoid fever. In the urine of one horse,

excreted in the course of twenty-four hours and collected in a hard-rubber vessel, he has made the following observations :

1. Horse, weighing 525 kilograms, affected with typhoid fever for two days ; pulse 85, respirations 36, temperature 41.1° . The lung is much diseased, the patient panting, appetite almost nil ; the urine collected in the last twenty-four hours with a specific gravity of 1,0367 contained 3.26 per cent of urea.

2. Horse, weighing 450 kilograms, sick for two days ; pulse 60, respirations 32, temperature 42° ; ate hay quite freely. The lung is slightly diseased. The urine during twenty-four hours at 15° and a specific gravity of 1,0432 contained 4.17 per cent of urea.

The author gives the results upon twenty-four horses affected with typhoid fever, of which number twelve have been treated with febrifuges and the other twelve with the ordinary means. All were affected in about the same degree and were in about the same state as to age and condition. Those belonging to the first category were covered with cold blankets, received various antifebrics internally and cold injections into the rectum. In neither set was there any mortality. The temperature was the same in all the patients, although a few tenths of a degree lower in those of the first category. But, if the febrifuge treatment did not sensibly lower the bodily temperature it was nevertheless evident that this treatment diminished the suffering of the animals and maintained them in a more comfortable condition.

Statistics relative to the febrifuge treatment in veterinary medicine are still incomplete, but the results so far obtained seem to speak in its favor ; it would be wrong to *affirm* that this treatment is not resorted to advantageously merely because of the very good results that have been obtained in human medicine. In fact, statistics show that in man the mortality from typhoid fever treated by the ordinary methods is 30.4 per cent, and in those treated by the antifebric treatment only 5 per cent ; in the latter cases it is necessary to consider also the number of cases fatal from perforation of the peritoneum with intestinal hemorrhage.

In the antipyretic treatment adopted by Albrecht, hydrotherapy plays the principal rôle. It consists in enveloping the patients with blankets or cloths and giving them cold injections into the rectum. The body is covered with two sheets or

cloths steeped in water with a temperature of 6 or 7° C., over which is placed a woolen blanket. These applications are renewed every twenty minutes, and from four to eight times according to the state of the heart and the nervous system. Previous to the application, dry friction or friction with camphor water or even mustard may be given in the lymphatic and thick-skinned horses. To complete this Priessnitz dressing, cold clysters of six to eight quarts are given every hour or two according to the state of the subject.

When there is excessive weakness of the heart, with a small, feeble, frequent pulse, cold skin and elevated temperature, care should be used not to apply the compresses too cold, not to renew them too frequently, and to prevent the evaporation by using two or three woolen blankets. In this manner the body is enveloped by a veritable vapor bath which diminishes the erethismus of the skin and accelerates the circulation of the integument. The capillary blood vessels of the skin widen and at the same time the beats of the heart become less labored and more regular.

These cold compresses have only a feeble action upon the rectal temperature, and it is necessary to continue them for eight or ten hours in order to lower the fever one degree. These remarks apply also to the heart. After two or three applications the pulse diminishes only eight to ten pulsations, while in man whose body is completely enveloped, the pulse is reduced twenty to forty per minute. But if these compresses do not sensibly slow the heart contractions they have the advantage of regulating them, and giving them more volume and diminishing, consequently, the tension of the vessels.

The cold rectal injections have as an immediate effect, an augmentation of the heart beats. The pulse becomes larger and more frequent. Through the excitation of the splanchnic nerves, they provoke peristaltic movements and a contraction of the intestinal vessels in which the blood is collected in abundance as well as the collateral vascular systems. They stimulate the course of the blood in the portal vein, the secretion of the bile, the intestinal glands, and re-establish the functions of the digestive apparatus.

If a cold compress be applied upon the body of a man, especially along the spinal cord, the respirations become deeper and slower. In the domestic animals, and especially in the

dog, these compresses produce, on the contrary, an augmentation of the number of respirations, and it would be interesting to know in what measure this inverse action is caused by the same degree of cold, and what rôle the psychical effect exercises in the patient, the subject of experiment. It is true that the augmentation in the respiratory movements lasts only for some minutes, after which the respirations return to their previous rhythm; this is proved by the following observations made upon animals affected with diverse diseases:

HORSE AFFECTED WITH TYPHOID FEVER.

Before the Cold Compresses.

| Respiration. | Pulse. | Temperature. |
|--------------|--------|--------------|
| 30 | 80 | 40.8° C. |

After the Cold Compresses.

| | Respiration. | Pulse. | Temperature. |
|---------------------------|--------------|--------|--------------|
| After 2 minutes | 34 | 80 | 40.8° |
| " 5 " | 33 | 80 | 40.8° |
| " 10 " | 33 | 76 | 40.8° |
| " 15 " | 32 | 76 | 40.8° |
| " 20 " | 30 | 74 | 40.6° |

COW AFFECTED WITH SEPTIC METRITIS.

Before the Cold Compresses.

| Respiration. | Pulse. | Temperature. |
|--------------|--------|--------------|
| 22 | 90 | 41.2° |

After the Cold Compresses.

| | Respiration. | Pulse. | Temperature. |
|---------------------------|--------------|--------|--------------|
| After 2 minutes | 24 | 90 | 41.2° |
| " 5 " | 26 | 96 | 41.2° |
| " 10 " | 26 | 92 | 41.2° |
| " 15 " | 26 | 88 | 41.2° |
| " 20 " | 26 | 88 | 41.2° |

DOG AFFECTED WITH DISTEMPER.

Before the Cold Compresses.

| Respiration. | Pulse. | Temperature. |
|--------------|--------|--------------|
| 44-45 | 110 | 41.3° |

After the Cold Compresses.

| | Respiration. | Pulse. | Temperature. |
|---------------------------|--------------|---------|--------------|
| After 2 minutes | 60-70 | 110-120 | 41.3° |
| " 5 " | 70-80 | 130-160 | 41.3° |
| " 10 " | 60-70 | 110-120 | 41.3° |
| " 15 " | 60-70 | 100-110 | 41.3° |
| " 20 " | 60-70 | 100-110 | 41. |

The above observations show the following facts: (1) That the internal temperature and number of heart beats do not diminish after the application of cold compresses. (2) That the respiratory movement in all the animals, especially in the dog, are sensibly increased when the body can be entirely plunged into a bath. Although the respiratory movements do not have the same amplitude as in man in similar conditions, it can be remarked that the respirations in animals increase while the number of pulsations decrease. The mass of the blood remains longer in contact with the air in the lungs; the oxygenation is more complete and the general circulation approaches the normal.

Certain practitioners pretend that in diseases of the respiratory passages the cold compresses should only be employed with the greatest care, because the cold water, by cooling the blood contained in the peripheral vessels, may exercise a morbid action upon the heart and lungs. But there need be no fear of "chilling" the animal when placed into a warm stable and not exposed to a current of air. The cloths and blankets and water are brought to a temperature of 6 to 7°. After making dry friction upon the body in order to stimulate the nervous system, the cloths or sheets to be applied are steeped in the water and wrung dry. They are then covered with the woolen blankets which, maintained in place by bands of straw, are applied closely over the body so as to prevent evaporation. It may be remarked that in all cases complicated with lesions of the heart, the compresses of Priessnitz have no serious consequence if the water used in the first application is warmer than 6 to 7°; in the succeeding applications the water can be gradually reduced to the above temperature. Besides, in human medicine bronchitis and other diseases of the respiratory passages in children have been successfully treated with cold baths and compresses without regard to the weakness of the heart which ordinarily accompanies such conditions.

Cold water applied upon the surface of the body or given in rectal injections produces an excitation of the peripheral nervous system and acts, by a centripetal action, upon the brain, whose function is suspended. Patients, in a comatose state raise the head and show attentiveness; often the appetite, an indication of a general amelioration, is soon in evidence. Even after application is discontinued the cold compresses act for

one to one and a half hours upon the respiration and the nervous system; the cooled skin reacts and becomes the seat of considerable hyperemia. A part of the animal heat is absorbed by the wet coverings, and the woolen blankets absorbing the vapor act, as it were, like the skin itself. When the blankets begin to dry on the outside they should be renewed or replaced by dry ones according to the condition of the patient.

Through the afflux of blood into the skin and the subjacent muscles, the compress produces a depletion or revulsive action upon the internal organs, especially upon those which are the seat of inflammation. The peripheral nervous system, enveloped by a veritable bath of vapor, is in the same conditions of temperature as the central system and the nervous irritations diminish in the entire organism.

It is for this reason that patients at first excited by this treatment afterward become quiet and fall into an absolute state of sleep. Certain febrile subjects show at the beginning a certain disturbance by a slight excitation of the respirations and various movements of the body; but these symptoms should only be attributed to the hyperemia following an elevation of temperature. As to the number of compresses necessary and the time required to leave them on the body, one must be guided by the intensity and the gravity of the symptoms of the disease. Thus, when the pulse is more rapid and feeble and the internal temperature high, the compress must be renewed a number of times to make the skin react. If it is intended to produce a simple, revulsive action, oil-cloth can be applied underneath the wet cloths after the appearance of peripheral hyperemia, in order to prevent the cutaneous evaporation.

Alcohol is very efficacious in fever in animals. It first excites the nervous system and activates the functions of the heart. It is readily decomposed into water and carbonic acid, acts as a narcotic and antithermic and lessens the process of tissue metamorphosis. Given in small doses, Greb has found that it increases the temperature two degrees, while in larger doses, (three pints of absolute alcohol) the temperature is lowered from three to four degrees. As horses nearly always refuse to take water to which large doses of alcohol have been added, and as it is imprudent to drench them with it, Albrecht has

given horses affected with typhoid pneumonia six liters of beer daily, one liter every two hours. This did not lower the temperature, but the pulse became larger, the respirations more regular and the general state of the animal sensibly ameliorated. Cattle take drenches of alcohol more readily than horses, but the effects obtained are still less marked. Thus, cows affected with puerperal fever and parenchymatous mammitis have received two liters of whisky containing forty to forty-five per cent of alcohol, in one-fourth liter doses every two hours; the result of this was an acceleration of the pulse and the respirations. During the twenty-four hours, the temperature was in some instances increased, in others decreased, that is to say, there were the same variations as in those animals which had not been submitted to this treatment.

En résumé, alcohol in small doses exercises a stimulating influence upon the nervous system and the circulatory apparatus. In large doses, it lowers the temperature in the horse, but beyond this effect, it exerts but little influence favorable to the evolution of a disease, and it is inadvisable to use alcohol to combat fever in the domestic animals. Small doses of alcohol can be advantageously replaced by digitalis and hypodermic injections of camphor or ether. For camphor hypodermics Dr. Carl Bassner recommends the camphor to be melted in a solution of paraffine (2 to 8) at a low temperature; this produces a very clean liquid, readily preserved, and which acts with great efficacy.

In veterinary medicine, the application of the various methods of hydrotherapy is often difficult, and it is then necessary to have recourse to drugs which certain physicians consider dangerous, but whose innocuousness have been proved by Albrecht, who has given to different subjects large doses of antifebrin. A horse in good health, weighing 350 kilos, (750 pounds) has received 250 grams, (60 drams) in the course of five days.

| | Time of observation. | Temperature. | Pulse. | Respiration. |
|---------------------------------|-------------------------|--------------|--------|--------------|
| February 6, 80 grams antifebrin | 2.50 p. m. | 38 | 40 | 19 |
| | 3.50 | 38.2 | 42 | 22 |
| | 5.15 | 38.1 | 44 | 19 |
| | 6.15 | 37.8 | 44 | 19 |
| | 7.25 | 37.7 | 43 | 16 |
| | 8.25 | 38.8 | 44 | 16 |
| | 9.30 | 38.2 | 41 | 17 |

| | Time of observation. | Temperature. | Pulse. | Respiration. |
|-----------------------------------|-------------------------|--------------|--------|--------------|
| February 8, 80 grams antifebrin | 11.00 a. m. | 37.7 | 42 | 20 |
| | 12.00 | 37.6 | 45 | 20 |
| | 12.50 | 37.8 | 42 | 20 |
| | 1.40 | 37.8 | 48 | 18 |
| | 3.40 | 37 | 44 | 14 |
| | 4.10 | 37.3 | 46 | 13 |
| | 5.10 | 37.4 | 44 | 14 |
| | 6.30 | 37.5 | 40 | 13 |
| | 7.50 | 37.8 | 46 | 14 |
| February 10, 100 grams antifebrin | 4.30 p. m. | 38.5 | 44 | 18 |
| | 4.45 | 38.5 | 47 | 26 |
| | 5.00 | 38.5 | 47 | 26 |
| | 5.15 | 38.8 | 52 | 24 |
| | 6.40 | 38.5 | 45 | 18 |
| | 8.00 | 38.5 | 46 | 19 |
| | 9.15 | 38.2 | 47 | 18 |
| | 10.15 | 38. | 46 | 18 |

The same subjects had previously received twenty grams of antifebrin February 3, thirty grams February 4 and forty grams February 5.

This experiment demonstrates that antifebrin given in large doses has only a feeble action upon the frequency of the pulse and the respirations, while its influence upon the temperature is almost negative. Besides, the nervous and digestive systems are not affected. Similar observations have been made upon two other subjects of experimentation.

In cattle in good health large doses of antifebrin did not produce any symptoms of intoxication nor any other important alterations in the functions of the organism.

In order to obtain the maximum doses, Fürbinger has injected intravenously into a dog, six grams daily, for seven successive days. Only in the last day were there any symptoms of intoxication. According to Tereg, antifebrin regulates the functions of the heart and excites the nervous system. It arrests the progress of gangrene of the intestines and prevents the formation of certain products, such as indol, scatol and phenol, which occasion gangrene. It reduces the quantity of indican in the urine, diminishes (seven per cent) the bacteria contained in the feces in cases of fever, and regulates the functions of the digestive system.

Antifebrin, antipyrin and phenacetin do not lower the temperature in the healthy animal, but in doses of ten to fifteen grams it reduces the temperature from one to one-and-a-half degrees in horses with fever.

Certain authors advocate that an elevated temperature does not constitute a morbid entity and does not activate the lesions in the organs of feverish subjects which lesions are always caused by microbes whose infectious action, on the contrary, can be impeded by the elevated temperature. While it is not rare to see mild general symptoms with a high fever, it is certain that the latter diminishes the resistance of the organism and acts in a detrimental manner upon the subjective state of the diseased. As to the destructive action by high temperature upon the micro-organisms which cause the infectious diseases, it suffices to say that the fever is too low and consequently powerless to destroy the infectious germs or to sterilize their culture medium.

On this subject, the author refers to the temperatures necessary to destroy the infectious agents of certain diseases.

The bacillus of tuberculosis ceases to grow under the influence of temperature of 42° for several weeks. (Koch.)

The bacillus of malignant pustule ceases to grow but does not lose its virulence, after being exposed for several weeks to a temperature of 42° or to a temperature of 43° for several days. (Koch.)

The microbe of epidemic diseases of wild animals (wild seuche) is destroyed by a temperature of 80° continued for ten minutes or by boiling a short time, (Zürn.)

Anthrax bacillus. The fresh anthrax virus becomes harmless after being submitted to a temperature of 100° , or by the action of boiling water for two minutes. The dried virus is destroyed by a temperature of 110° , or by two hours boiling, (Zürn, Flügge.)

Mode of Action of Antipyretic Drugs.—After Tereg, some of these agents act upon the red blood corpuscles, by lessening their oxidizing power; others diminish the quantity of carbon dioxide contained in the expired air and reduce the process of organic combustion; others finally act as antiseptics, preventing intestinal fermentation and the development of micro-organisms. Among the antipyretics of the last category, one may cite ortho-oxyparatoluylic, dithiosalicylic, dyodsalicylic and

kresylester-salicylic acids, the different derivatives of anilin, etc. As to the mode of action of the other febrifuges most commonly employed in veterinary medicine, these act especially upon the heat centres and the vaso-motor nerves. Antifebrin has a narcotic and anti-rheumatic action ; the same is true of phenacetin and oxalgesin, especially employed with success against analgesia.

It has been demonstrated by Heurijean that certain antifebrics decrease oxidation in the rabbit. Employing hypodermic injections, he has determined the quantity of oxygen inspired before and after each administration in the following manner :

| <i>Before Injection.</i> | | | <i>After Injection.</i> | | |
|--------------------------|-------------------------------|--------------------|-------------------------|------------------|---------------------------|
| Temp. | Oxygen inspired. p. h. cc. | Material injected. | Temp. | Oxygen inspired. | Diff. of oxygen insp. cc. |
| 40.6 | 819.99 | .70 gm. kairin | 38.4 | 646.93 | 173.06 |
| 41.4 | 1068.06 | 1.25 antipyrin | 39.75 | 911.18 | 156.88 |
| 41.2 | 1032.27 | 2.00 " | 39.70 | 864.12 | 168.15 |
| 41.3 | 4105.00 | 2.00 sod. salicyl. | 40.1 | 798.33 | 206.67 |
| 40.6 | 1119.25 | 3.00 " | 40. | 924.48 | 194.77 |
| 41.3 | 941.64 | 1.2 quinine . . | 39.7 | 824.18 | 127.24 |

Kumogawa has demonstrated that in healthy dogs in good condition normal doses of the customary febrifuges augment the combustion of the albuminous matters in the following proportions : benzoate of soda, maximum 19-20 per cent, mean 25 per cent ; benzoic acid, maximum 17-20 per cent, mean 6-8 per cent ; this acid having a decided antiseptic action upon the intestines. The same observations have been made upon salicylate of soda, salol, antefebrian, sulphate of thallium, etc. Quinine is the only exception, and, on the contrary, diminishes the combustion of the albumen in the healthy animal.

According to Maragliano, antipyrin diminishes the quantity of urea in man both in health and diseases with fever. The experiments of Bauer demonstrate that the antipyretics diminish the temperature of the body but not the combustion of albumen. Likewise Symanowski cites a series of nervous affections (neuroses in man) in which these agents lower the temperature without any pathological diminution in the nutritive changes.

En résumé, these observations show the following conclusions :

1. That in the domestic animals the internal temperature rarely exceeds 43°.

2. That animals resist an elevated temperature for several days and even for months without fatal results.

3. That in numerous febrile diseases the gravity of the general symptoms is not always in relation with the degree of elevation of the bodily temperature.

4. That it is not certainly proved that a very elevated temperature destroys the micro-organisms, the essential agents of fever, but that this temperature enfeebles the organism and acts unfavorably upon the vascular and nervous systems.

5. That in subjects affected with benign diseases it suffices to regulate the diet; that it is necessary to have recourse to antipyretics only in grave diseases, not only to lower the temperature but rather for the favorable action of these drugs upon the heart, nervous system and digestive apparatus.

6. These effects are obtained from compresses and cold irrigations or, better, from cold baths in the lower animals. Hydrotherapy is very economical, and should be replaced by the chemical febrifuges only when it is impossible to apply them.

The large doses of alcohol necessary to lower the internal temperature are harmful rather than useful to the organism.

7. This agent should be employed only in small doses and as an excitant in order to prevent a state of collapse. It can be advantageously replaced by hypodermic injections of camphor or ether, which at present are but little used in veterinary medicine.—*Rec. de Méd. Vét.*, August, 1895.

OBITUARY.

PROFESSOR PASTEUR DEAD.

EXPIRES IN THE CITY OF HIS GREATEST LABORS.

PARIS, Sept. 28.—Professor Louis Pasteur, the eminent bacteriologist, died here this evening at 5 o'clock.

Professor Pasteur had suffered from paralysis for a considerable period. About eight days ago he sustained a violent paralytic stroke and yesterday suffered still another severe attack. He grew worse rapidly and remained in a comatose condition during his last hours. His death was absolutely without pain.

Louis Pasteur was born at Dole, in the department of the Jura, in 1823. He entered the University at the age of eighteen, as usher in the College of Besancon, and was admitted three years later a pupil of the Normal School. He was doctor in 1847, professor of physics at the College of Dijon in 1848, and professor of chemistry in the Strasburg Faculty of Sciences in 1852; next director of sciences at the Normal School, professor of geology, physics and chemistry at the School of Fine Arts, and professor of chemistry at the Sorbonne.

In 1852 he was elected a member of the Academy of Sciences in the section of mineralogy. The Royal Society of London awarded him the Rumford medal in 1856 and the Copley medal in 1874. A prize of 10,000 florins was conferred on him by the Minister of Agriculture, in Austria, for his discoveries in the maladies of silkworms; a prize of 12,000 francs was awarded to him in 1873 by the Societe d'Encouragement, and the National Assembly voted him in 1874 a life pension of 12,000 francs. The Emperor Napoleon made him a Senator on July 27, 1870, but the decree was never promulgated.

The greatest reward he received from his country for his scientific services was his admission on April 28, 1882, to the French Academy to succeed M. Littré. When still an obscure physician his first studies were the chemical processes of fermentation, and these studies led him to investigate the phenomena of disease in living bodies resembling fermentations. The

silk-worm industry in France was threatened with destruction; Pasteur was called in, examined the mysterious disease that was killing the worms, and suggested the remedy. The wine-growers of France and Italy complained of their wines being slow to mature, and prone to turn sour; Pasteur's investigations on the yeast germs taught the grower how these evils could be cured, and the process of Pasteurizing wine is universally recognized. No more fatal disease than anthrax, or charbon, attacks sheep and cattle: Pasteur's discovery of the bacillus anthrax, the microbe which propagates the disease, suggested the means of guarding against it. These discoveries represent a gain to the community of tens of millions of dollars; and if Pasteur could have so far forgotten the obligations of science as to take out patents, according to commercial principles, he would have been, to quote Dr. Lankester, "the richest man in the world."

To assign a money value to the inquiry that has of late years occupied his attention would be simply impossible; for the subject was hydrophobia, and how to prevent this dread disease running its fearful course. He commenced by careful experiments on animals in 1880, and he showed that rabies was the result of a specific poison, not a mere form of tetanus, still less a creature of the imagination.

PASTEUR'S THEORY.

Pasteur's conclusions were experimental demonstrations publicly announced to the scientific world, and verified by a Government commission. These experiments were made on dogs, rabbits, guinea-pigs and monkeys. It was his theory that animals inoculated with hydrophobia virus would not go mad, and he demonstrated this by this method: He inoculated dogs with a very weak virus from a rabbit; that is, a virus having a long period of incubation, and at the same time he inoculated a rabbit. When this rabbit went mad and died, the dogs were again inoculated from it, as well as a third rabbit. The process was repeated with the dogs and a fourth rabbit, and so on, till the virus had greatly increased in activity. The first weak inoculation protected them from the second, the second from the third, and so on, till they could stand the strongest virus. The Government commission reported that of nineteen dogs

not treated by Pasteur, seventeen took rabies, while of twenty-three dogs which he had treated by his inoculations, not one took the disease.

The critical point was the application to human beings. The first to be treated was a child—Joseph Meister—who had been bitten in fourteen places by a mad dog. Pasteur, on the 6th of July, 1885, began by inoculating the child with a weak virus that would not produce rabies in a rabbit; he increased the strength of the virus daily, and on the 16th inoculated with virus so strong as to produce rabies in a large dog in eight days. The child, according to all reports, is in perfect health. Some modifications in details have been made, but the process remains, on the whole, as described. Between July 6, 1885, and June 11, 1886, Pasteur treated 1335 patients; of these, 740 cases were of persons bitten by dogs well ascertained to be mad. The usual estimate of deaths by hydrophobia is that 16 per cent of those bitten by mad dogs die; according to this, 118 of Pasteur's patients ought to have died. There died only four.

His success in Paris was soon followed by the establishment of branch institutes in London and New York. Hundreds of patients have been successfully treated in these places. Dr. Gibier, one of Pasteur's pupils, has been in charge of the American branch since its establishment.

WOLF BITES TREATED.

Pasteur also applied his treatment to wolf bites. Wounds inflicted by wolves are of greater depth and extent than those inflicted by dog bites, and are usually in such dangerous places as the face or throat. The usual percentage of death from rabid wolves is 66.5 per cent. Of 48 cases treated by Pasteur, only seven died; that is, he reduced the percentage to 14 per cent.

Pasteur's reception at the French Academy in 1882 was an auspicious one. He signaled it by attacking his predecessor, M. Littré, and was replied to by Joseph Ernest Renan. Pasteur defended his father in spiritualism and Renan aired his theological skepticism.

The following gruesome description of M. Pasteur's laboratory gives a striking picture of the modern physiological workshop: "All the animals in the laboratory, from the little white mice hiding under a bundle of cotton wool to the dogs barking

furiously from behind their iron railed kennels, are doomed to death. These inhabitants of the laboratory, which are marched out day after day in order to be subjected to operations or other experiments, share the space with still more ghastly objects. From all parts of France hampers arrive containing fowls which have died from cholera or some other disease. Here is an enormous basket bound with straw; it contains the body of a pig which has died of fever. A fragment of lung, forwarded in a tin box, is from a cow dying of pneumonia. Other goods are still more precious. Since M. Pasteur two years ago went to Pauillac to await the arrival of a boat which brought yellow fever patients, he receives now and then from far-off countries a bottle of vomito negro. Tubes filled with blood are lying about, and small plates containing drops of blood may be seen everywhere on the work tables. In special stores bottle-like bladders are ranged resembling small liquor bottles. The prick of a pin into one of these bladders would bring death to any man. Inclosed in glass prisons millions and millions of microbes live and multiply."

M. Pasteur's views on vivisection are known well enough. His own words on the subject are: "Never should I have the courage to kill a bird for sport, but when it comes to experiments I have never been troubled by the slightest scruple."

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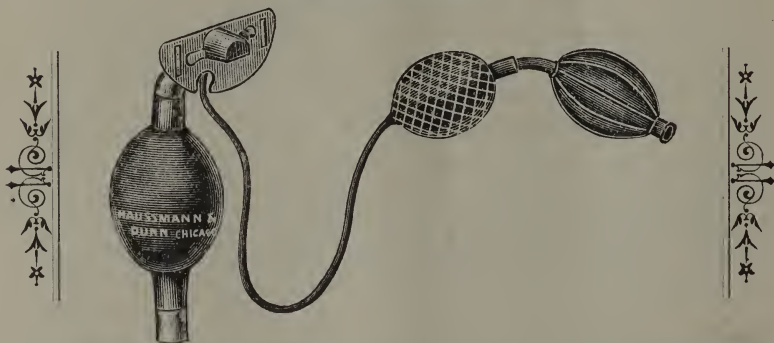
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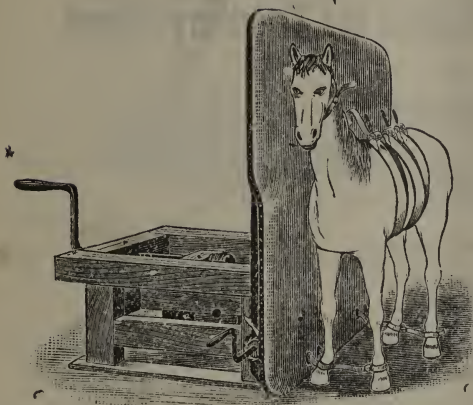
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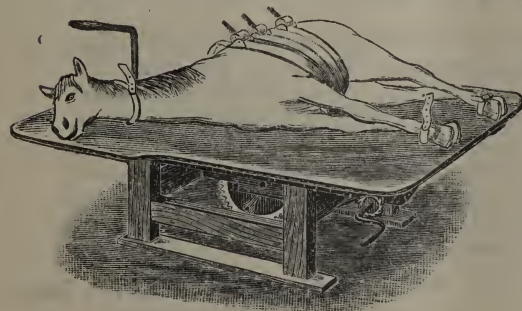
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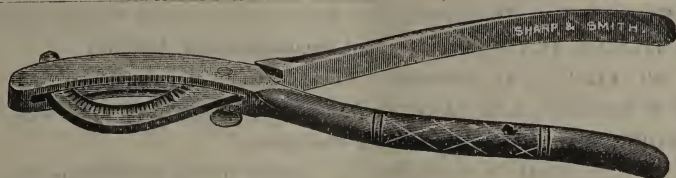
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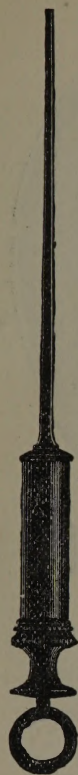
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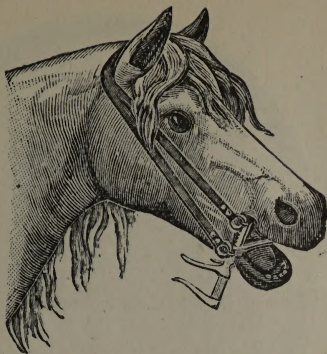
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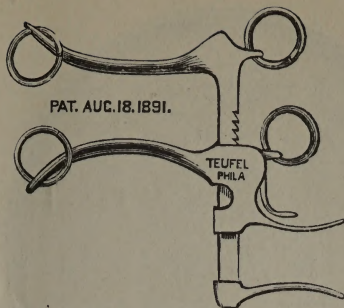
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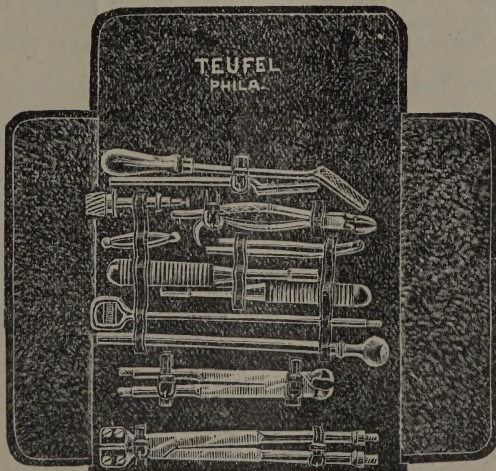
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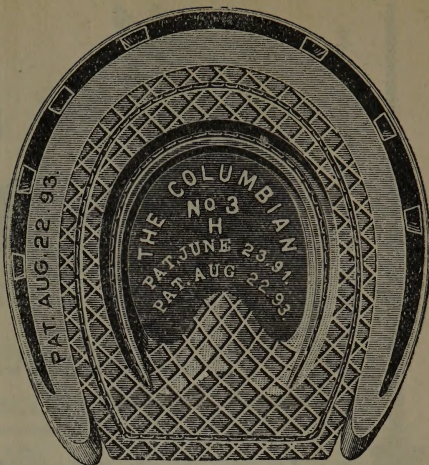
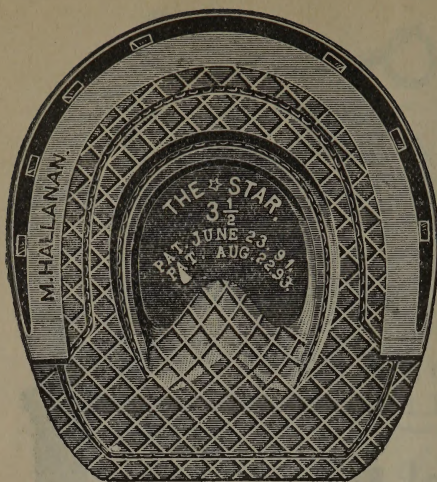
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